

# STRUCTURE OF MICROCARD

A01/1 = Structure of microcard

A03/1 = Special features, general instructions, safety measures, testers and tools, test specifications, tightening torques

B01/1 = Repair

N25/1 = Index

N27/1 = Table of contents

N28/1 = Editorial note

Continue: A02/1 Fig.: A01/2

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B	XXXXX	XXXXX	XXXXX	XXXXX	XXXXX	XXX		
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Continue: A02/1

## STRUCTURE OF MICROCARD

The user prompting appears on every page, e.g.:

- Continue: B17/1
- Continue: B18/1    Fig.: B17/2

.../1 = Upper coordinate half

.../2 = Lower coordinate half

Continue: A03/1

## SPECIAL FEATURES

These instructions describe the repair operations for:

- \* In-line pumps of series  
PE(S)..P..S 8000 without governor,  
LDA, timing device and supply pump.

The various types of governor are dismantled and assembled in line with the respective repair instructions.

Continue: A04/1

## GENERAL INSTRUCTIONS

### Misceleaneous:

These repair instructions cover all repair operations for in-line pumps of size "P", series "S 8000".

The various in-line pump versions are given in the corresponding service-parts lists.

Scrap worn and damaged parts.

Continue: A04/2

## GENERAL INSTRUCTIONS

### Misceleaneous:

Always renew sealing elements.

If injection-pump components are to be stored for a lengthy period, they should be covered and protected against rusting.

Wash out plunger-and-barrel assemblies and delivery-valve assemblies in cleaning agent: Moisten plungers with calibrating oil.

Rub over sealing rings with tallow.

Continue: A05/1

## SAFETY MEASURES

### Cleaning of components:

Wash out components in cleaning agent such as chlorothene NU, which is both commercially available and not readily flammable.

Pay attention to the following safety regulations !!!

In Germany:

Order Governing Work with Combustible Liquids (Vbf) as published by Federal Labor Ministry (BmA).

Continue: A05/2

## SAFETY MEASURES

Safety regulations for handling chlorinated hydrocarbons

Companies ZH 1 / 222

Employees ZH 1 / 119

as published by the Hauptverband für Gewerbliche Berufsgenossenschaften (Zentralverband für Unfallschutz und Arbeitsmedizin), Langwartweg 103, 5300 Bonn 5, Germany.

As regards other countries, attention is to be paid to the appropriate local legislation.

Continue: A06/1

## SAFETY MEASURES

EXCLUSIVE use is to be made of the special tools listed in these repair instructions.

INJURIES CANNOT BE RULED OUT if these tools are not used !

Continue: A06/2

## SAFETY MEASURES

The procedure outlined in the Sections "REMOVING ROLLER TAPPET" and "FITTING ROLLER TAPPET" must be carried out with extreme care. When performing these operations, there is a possibility of sudden plunger-return-spring release and thus a DANGER OF INJURY !

The procedure outlined in the Section "DISMANTLING BARREL-AND-FLANGE ELEMENT" must be implemented with extreme caution. When carrying out this operation, there is a possibility of the snap ring fracturing on disassembly of the plunger-and-barrel assembly and thus a DANGER OF INJURY !

Continue: A07/1

## TESTERS, DEVICES AND TOOLS

- \* Puller KDEP 1056
- \* Support sleeve KDEP 1056/0/7  
Extraction of end covers from holes  
for holding up tappet
- \* Insertion device KDEP 1071  
Fitting of control sleeves
- \* Assembly device KDEP 1556
- \* Tubular lever from KDEP 1505  
Pressing down of roller tappets

Continue: A07/2

## TESTERS, DEVICES AND TOOLS

- \* Assembly sleeve KDEP 1548
- \* Assembly sleeve KDEP 1549  
Protection of drive-end cylindrical-  
roller bearing when installing  
camshaft
- \* Spacers KDEP 1550  
For fitting beneath barrel-and-  
valve assemblies
- \* Pressing-in tool KDEP 1551  
Pressing of cylindrical-roller  
bearing into bearing end plate
- \* Pressing-in tool KDEP 1552  
Pressing in of roller-bearing outer  
race

Continue: A08/1

## TESTERS, DEVICES AND TOOLS

- \* Tappet holder                      KDEP 1553  
Holding up tappet
- \* Holding wrench                      KDEP 1555  
Counter-holding and turning of  
camshaft
- \* Pressing-on tool                      KDEP 1558
- \* Pressing-on tool                      KDEP 1559  
Installation of radial-lip-type oil  
seal in bearing end plate
- \* Support ring                          KDEP 1568

Continue: A08/2

## TESTERS, DEVICES AND TOOLS

- \* Fixture                              KDEP 1569  
Pressing-in and pressing-out of  
roller bearings
- \* Extractor                              KDEP 1570  
Extraction of bearing ring from  
bearing end plate
- \* Retaining pin                          KDEP 1571  
Holding up of plungers for  
leak test
- \* Pressing-in mandrel                      KDEP 1574  
Fitting and removing base covers

Continue: A09/1

## TESTERS, DEVICES AND TOOLS

- \* Pliers KDEP 1575  
Removal and insertion of pump plungers
- \* Pin-type socket wrench KDEP 1577  
Screwing out and screwing in of threaded bushes at control rod
- \* Pressure plate KDEP 1580  
Pressing in of roller bearing (inner race)
- \* Pressing-in mandrel KDEP 1598  
Pressing of end covers into holes for holding up tappets

Continue: A09/2

## TESTERS, DEVICES AND TOOLS

- \* Assembly tool KDEP 1714  
Assembly of snap ring on barrel-and-valve assembly
- \* Pressing-out sleeve KDEP 1735  
Pressing out of camshaft (inner race of roller bearing)
- \* Pressing-out disk + tubular element KDEP 1736  
Pressing out of roller-bearing outer race
- \* Holding wrench KDEP 2885  
Counter-holding and turning of camshaft

Continue: A10/1

## TESTERS, DEVICES AND TOOLS

- \* Puller KDEP 2911  
KDEP 2911/3  
Extraction of barrel-and-valve  
assemblies
- \* Extractor mandrel KDEP 2938  
Removal of tappet springs
- \* Tappet forceps KDEP 2941  
Removal and installation of  
roller tappets

Continue: A10/2

## TESTERS, DEVICES AND TOOLS

- \* Assembly tool for  
timing device KDEP 2944  
– Socket wrench KDEP 2944/0  
– Pin-type socket wrench KDEP 2944/1  
– Extractor mandrel KDEP 2944/2  
Removal and fitting of timing devices  
with 20 mm taper
- \* Mounting device KDEP 2962  
Holding of barrel-and-valve assembly
- \* Support clamp KDEP 2963  
Pumps with flange attachment

Continue: A11/1

## TESTERS, DEVICES AND TOOLS

- \* Clamping device                      KDEP 2985  
Device for bottom attachment
- \* Socket wrench                      KDEP 2986  
Loosening of delivery-valve holders
- \* Wrench                              KDEP 2997  
Turning of barrel-and-valve  
assemblies
- \* Directional-control  
valve                              KDJE-P 100/1  
Pressure reduction during leak test
- \* Drive coupling                      1 686 430 038

Continue: A12/1

## TEST SPECIFICATIONS

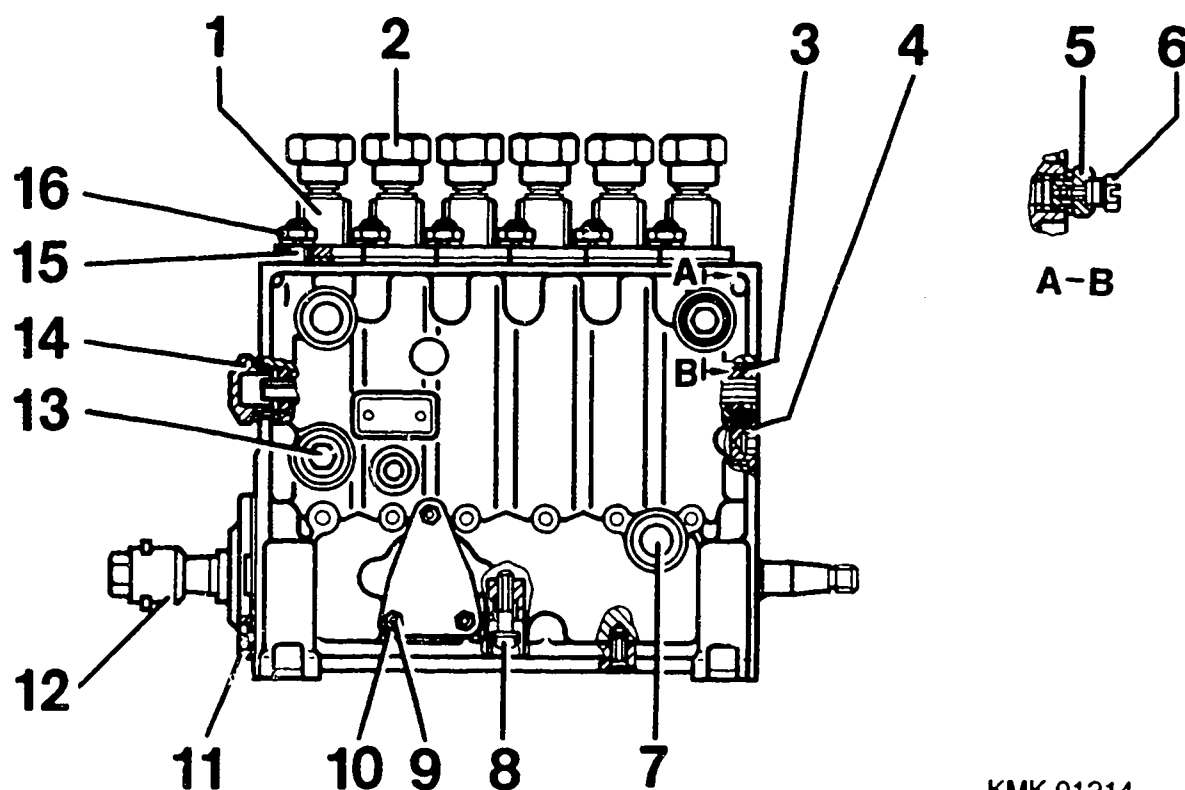
- \* Leak test - suction gallery  
8 minutes at 5 bar, then 1 minute  
pulsating 0 ... 5 bar.
- \* Leak test - camshaft, spring and  
governor chamber  
7 minutes at 1.5 bar, then  
1 minute at 0.5 bar.

Continue: A13/1

# TIGHTENING TORQUES

1 = Delivery-valve holder	110...120 Nm
2 = Cap nut	max. 25 Nm
3 = Control-rod guide bushing	30... 40 Nm
4 = Screw plug	40... 50 Nm
5 = Threaded bushing	20... 30 Nm
6 = Bleeder screw	4... 5 Nm
7 = Reducer bushing	
M 14 x 1.5	20... 25 Nm
M 16 x 1.5	30... 40 Nm
8 = Fillister-head screw for steel intermediate bearing	7... 9 Nm + 90 degrees!
9 = Threaded pin	3.5...4.5 Nm
10= Hexagon nut	7... 9 Nm

Continue: A14/1 Fig.: A13/2



KMK 01214

# TIGHTENING TORQUES

## 11= Attachment of bearing end plate

Fillister-head

screw M 6 9... 12 Nm

Torx bolt M 6 10... 12 Nm

Torx bolt M 8 18... 20 Nm

Hexagon-socket- M 6 10... 12 Nm

head cap screw M 8 18... 20 Nm

## 12= Couplings and timing device

Round nut:

taper 20 mm 85...100 Nm

taper 25 mm 100...110 Nm

Hexagon nut:

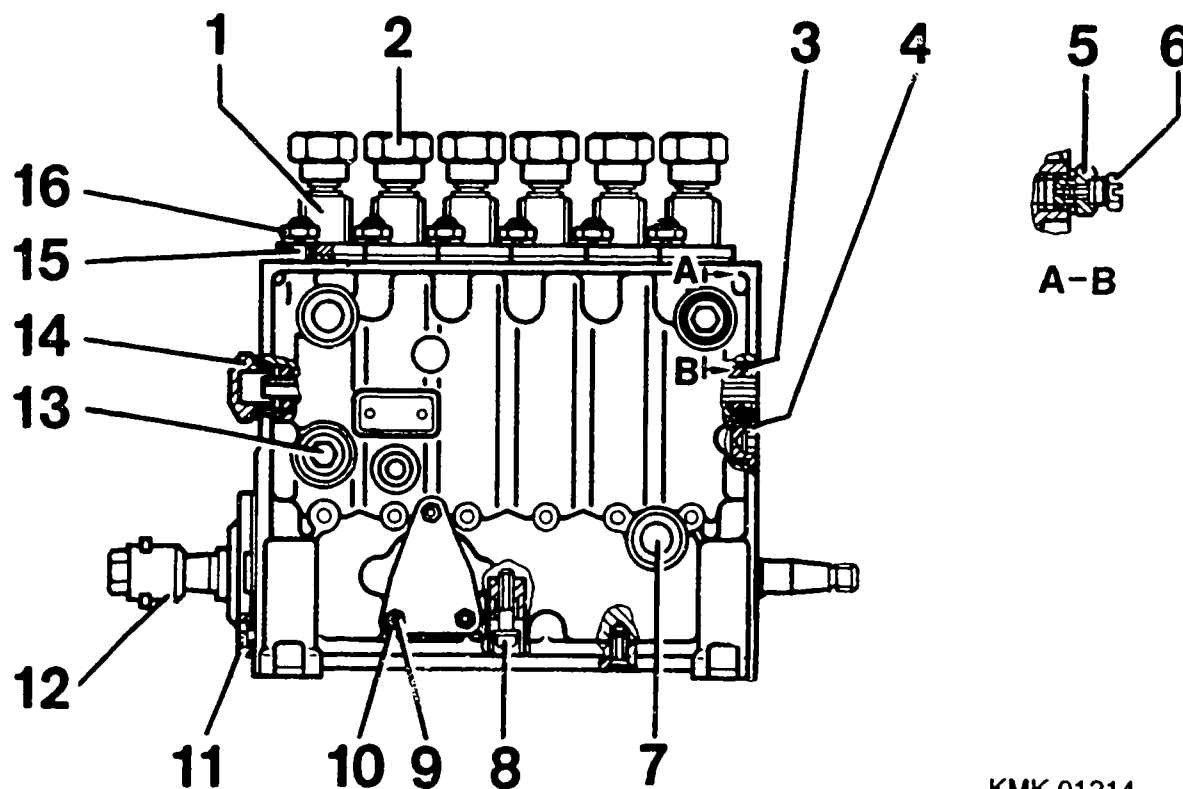
taper 20 mm 65... 75 Nm

taper 25 mm 100...110 Nm

taper 30 mm 150...170 Nm

taper 35 mm 350...370 Nm

Continue: A15/1 Fig.: A14/2

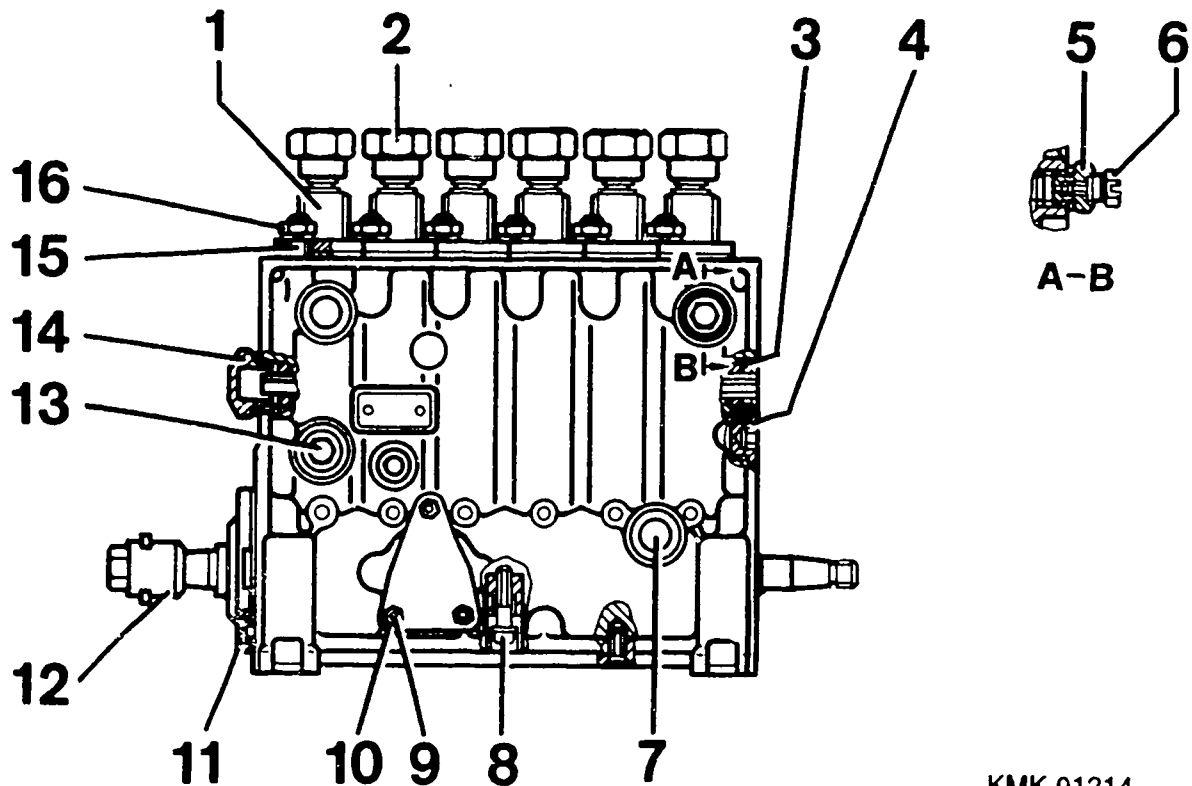


KMK 01214

## TIGHTENING TORQUES

13= Screw plug	40... 60 Nm
14= Cap	40... 60 Nm
15= Threaded pin	50... 54 Nm
16= Hexagon nut	50... 55 Nm

Continue: B01/1 Fig.: A15/2



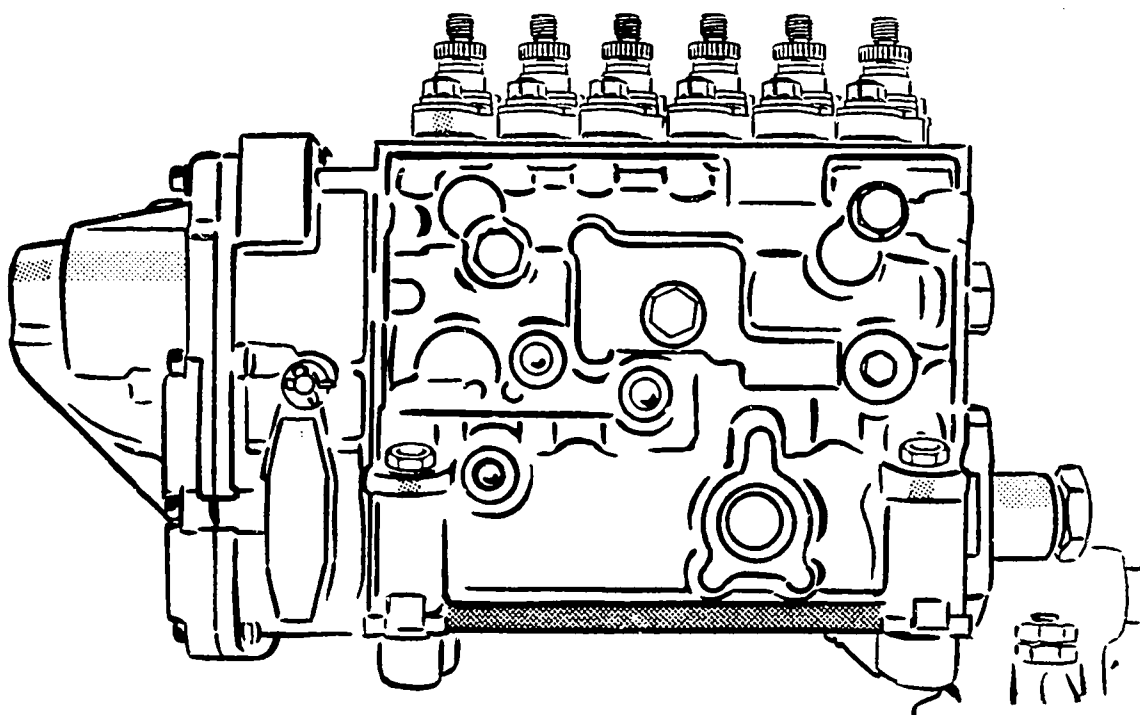
KMK 01214

## DISMANTLING INJECTION PUMP (WITHOUT GOVERNOR)

Clamp in-line pump PE..P.. with bottom attachment onto swivel-type clamping support KDEP 2919 in conjunction with clamping device KDEP 2985.

Pumps with flange attachment require the support clamp KDEP 2963 with suitable attachment flanges.

Continue: B02/1 Fig.: B01/2



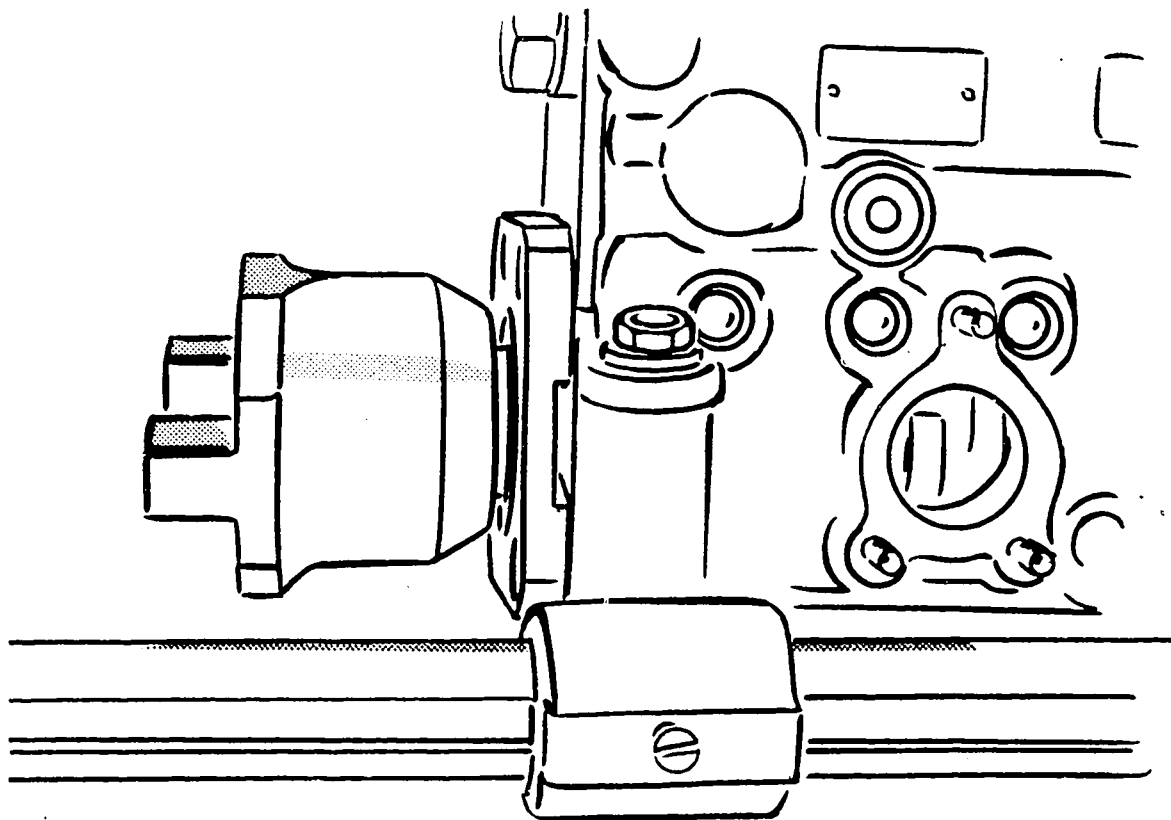
KMK 01215

## INSTALLING DRIVE COUPLING

Remove drive coupling.

Install drive coupling on camshaft.

Continue: B03/1 Fig.: B02/2



KMK 01216

## REMOVAL OF PRESTROKE SHIM

Losen fastening nuts of barrel-and-valve assemblies and continue turning approx. 3 turns.

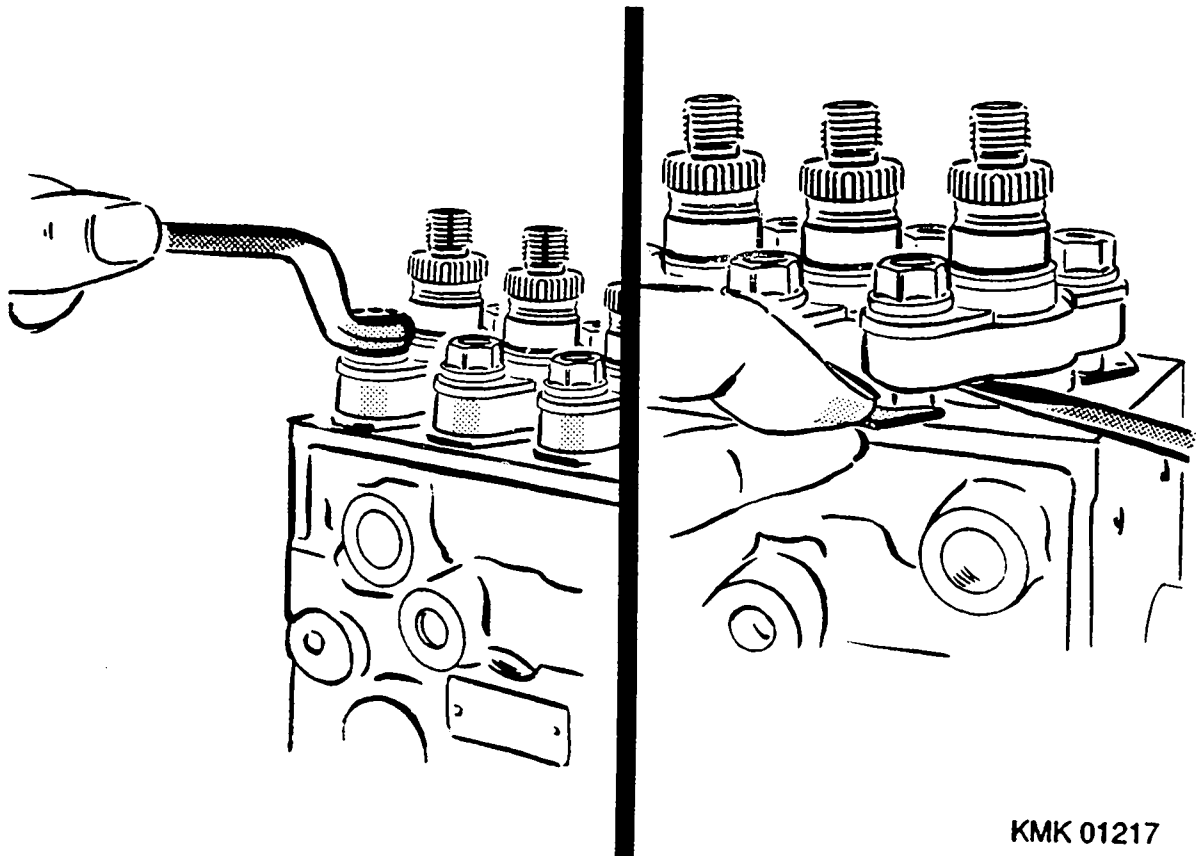
Raise barrel-and-valve assemblies with a screwdriver and remove prestroke shims.

### Note:

The prestroke shims are paired in terms of thickness.

It is therefore advisable to store them accordingly.

Continue: B04/1 Fig.: B03/2



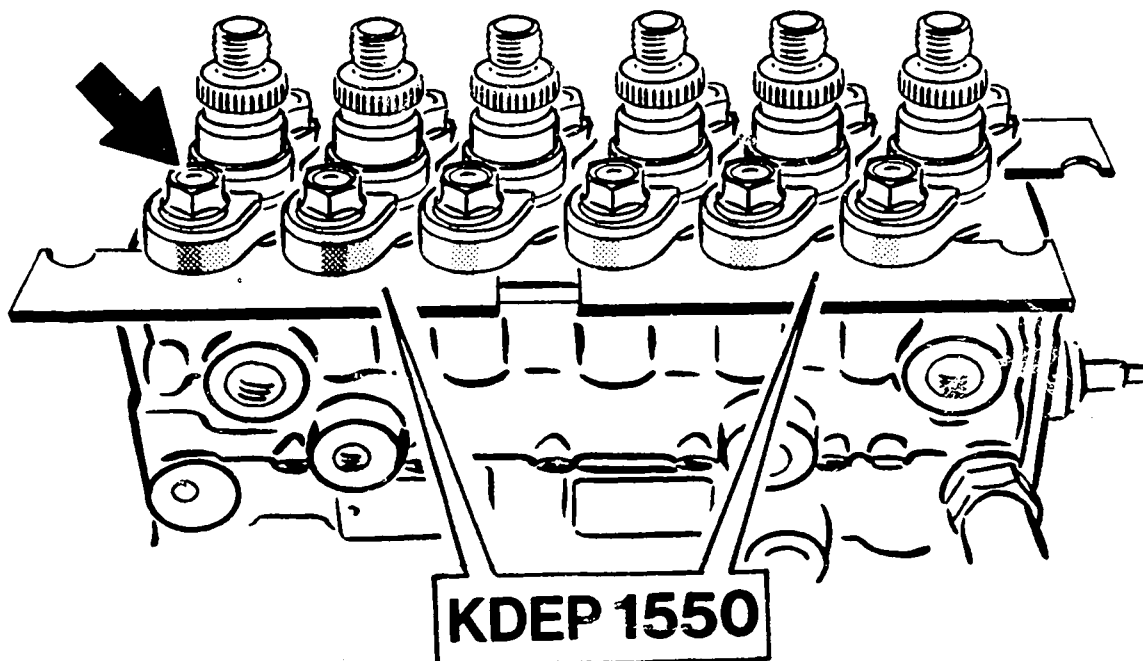
KMK 01217

## INSTALLING SPACERS 1550

Insert spacers KDEP 1550 instead of prestroke shims beneath flanges.

Temporarily tighten fastening nuts (arrow) again by hand.

Continue: B05/1 Fig.: B04/2

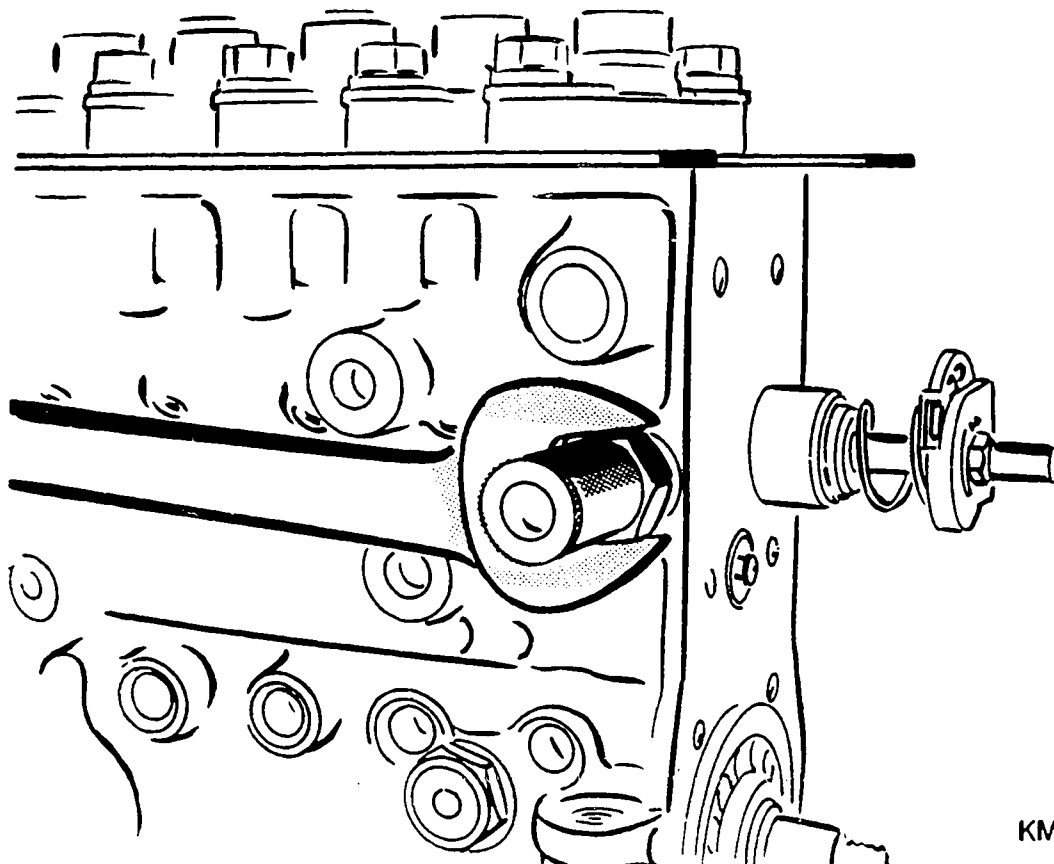


KMK 01218

## REMOVING ADD-ON MODULES

Screw out overflow valve.

Continue: B06/1 Fig.: B05/2

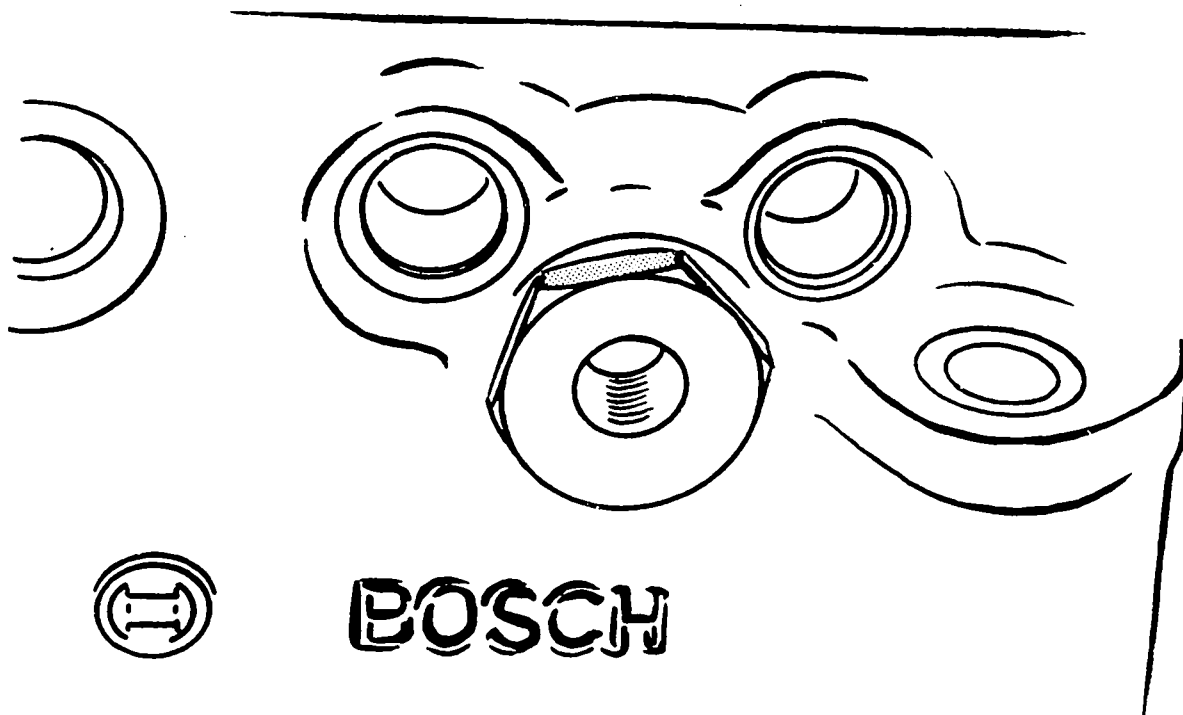


KMK 01219

## REMOVING ADD-ON MODULES

Screw out connecting nipple of oil  
return if fitted.

Continue: B07/1 Fig.: B06/2



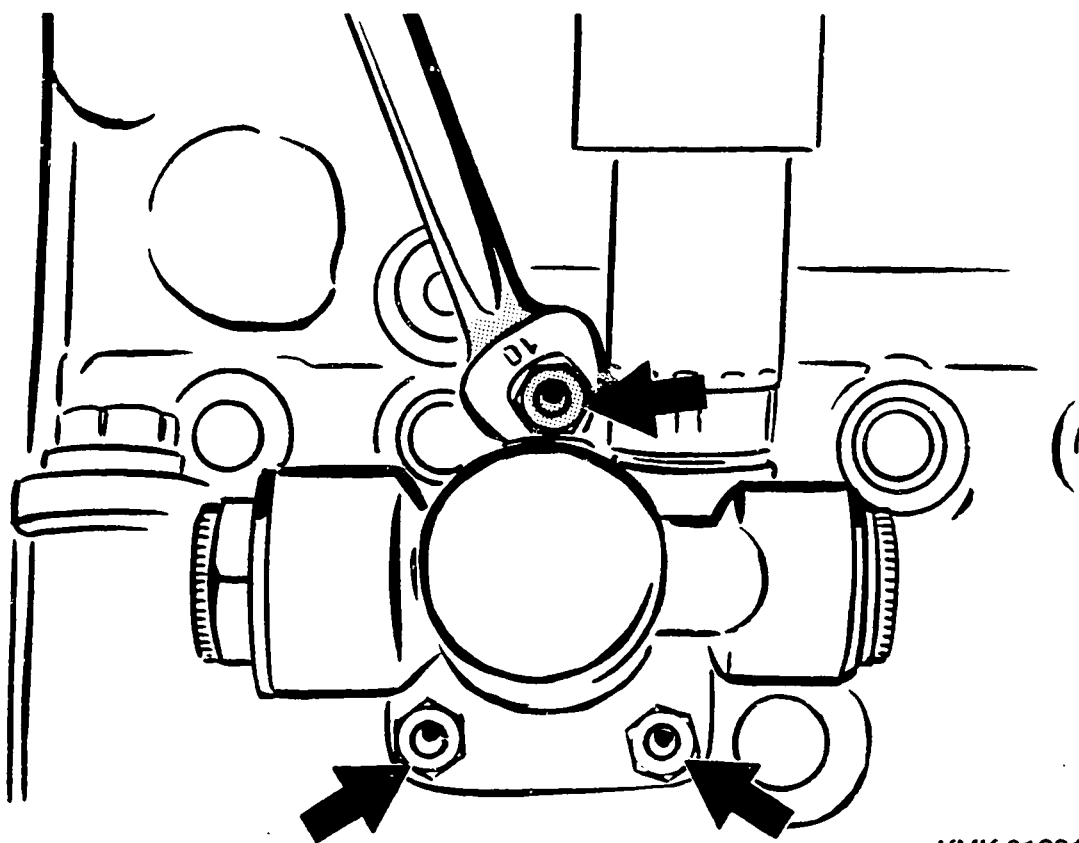
KMK 01220

## REMOVING SUPPLY PUMP

Loosen and unscrew hexagon nuts  
(arrows).

Remove supply pump and seal.

Continue: B08/1 Fig.: B07/1



KMK 01221

## DISASSEMBLING END COVERS

Attach support sleeve to fixture  
KDEP 1056.

Screw back wing nut of fixture and  
insert puller KDEP 1056 into end cover.

Screw in wing nut as far as possible,  
so as to expand collet chuck of  
fixture in end cover.

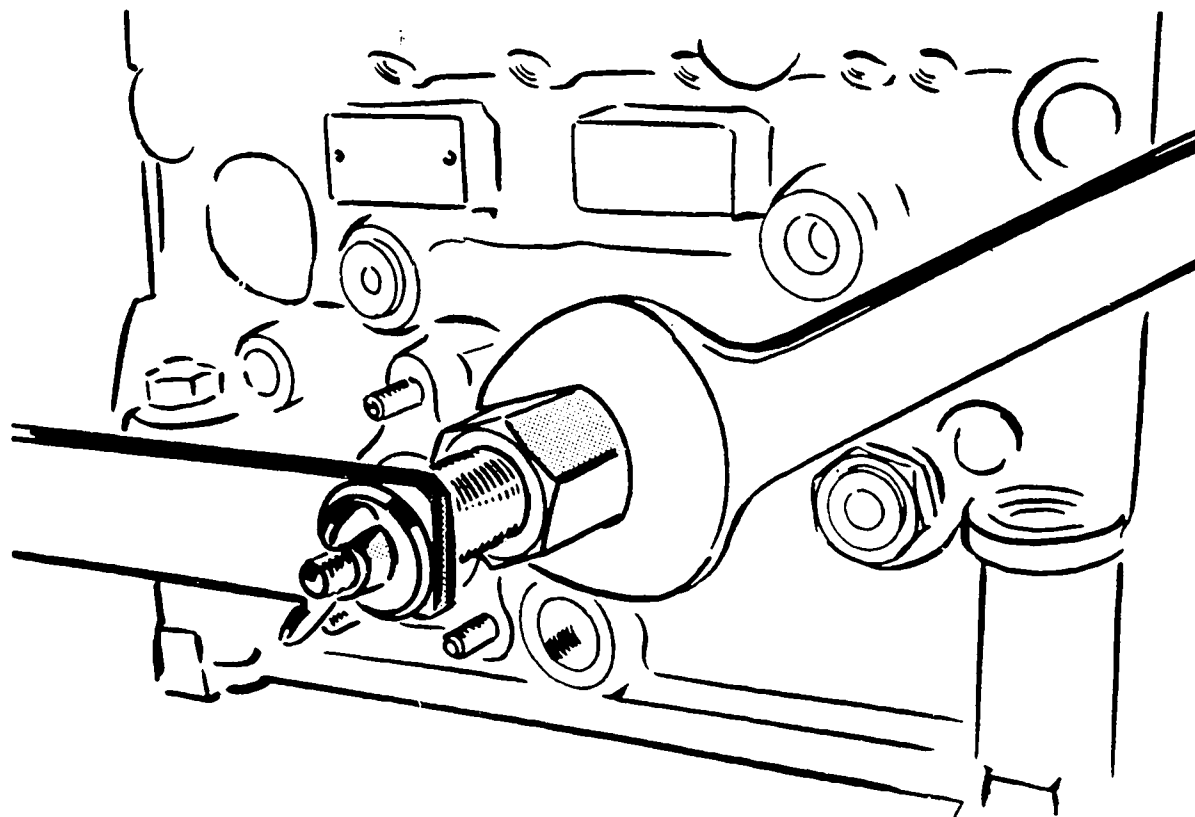
Continue: B09/1

## DISASSEMBLING END COVERS

Hold handle of fixture and turn sleeve of puller with wrench until end cover is pulled out of pump housing.

Remove end cover from fixture and scrap it. Re-use is not permitted.

Continue: B10/1 Fig.: B09/2



KMK 01222

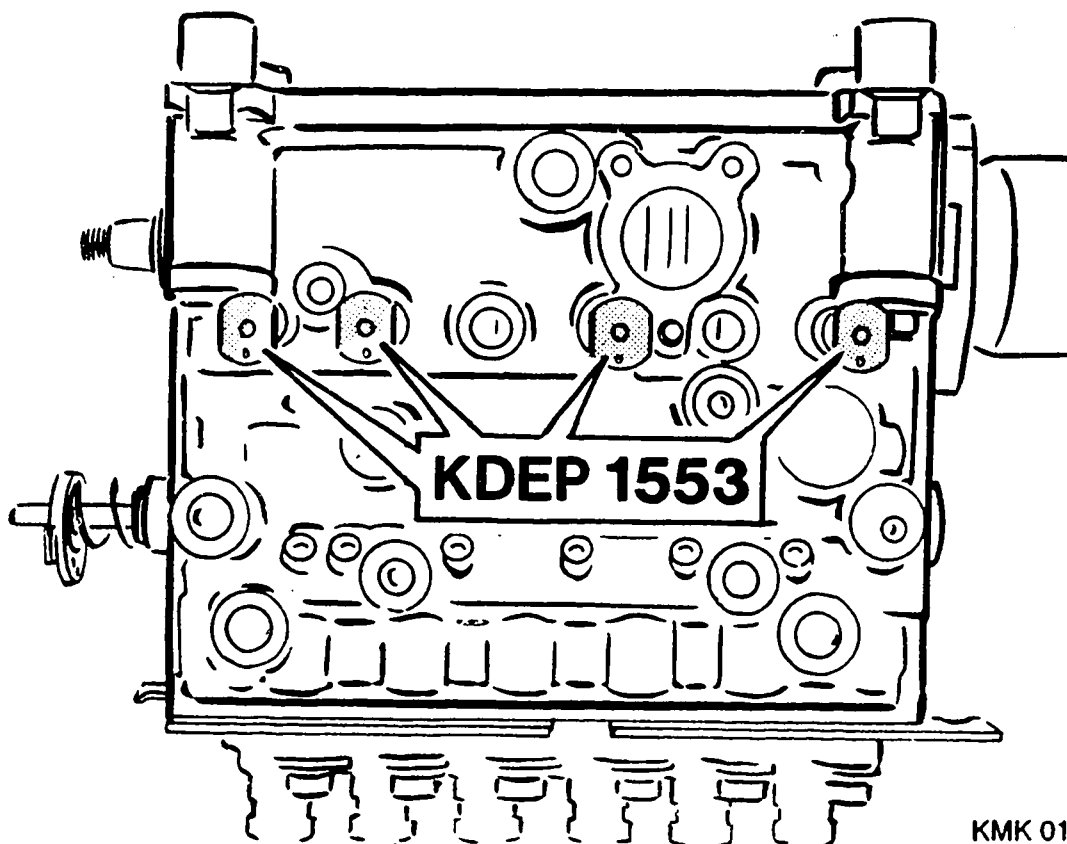
## FITTING TAPPET HOLDER

Turn injection pump around such that delivery-valve holders face downwards.

Attach holding wrench KDEP 2885 to drive coupling.

Provided that tappet holding-up hole is not covered by a roller tappet, insert tappet holder KDEP 1553 immediately.

Continue: B11/1 Fig.: B10/2



KMK 01223

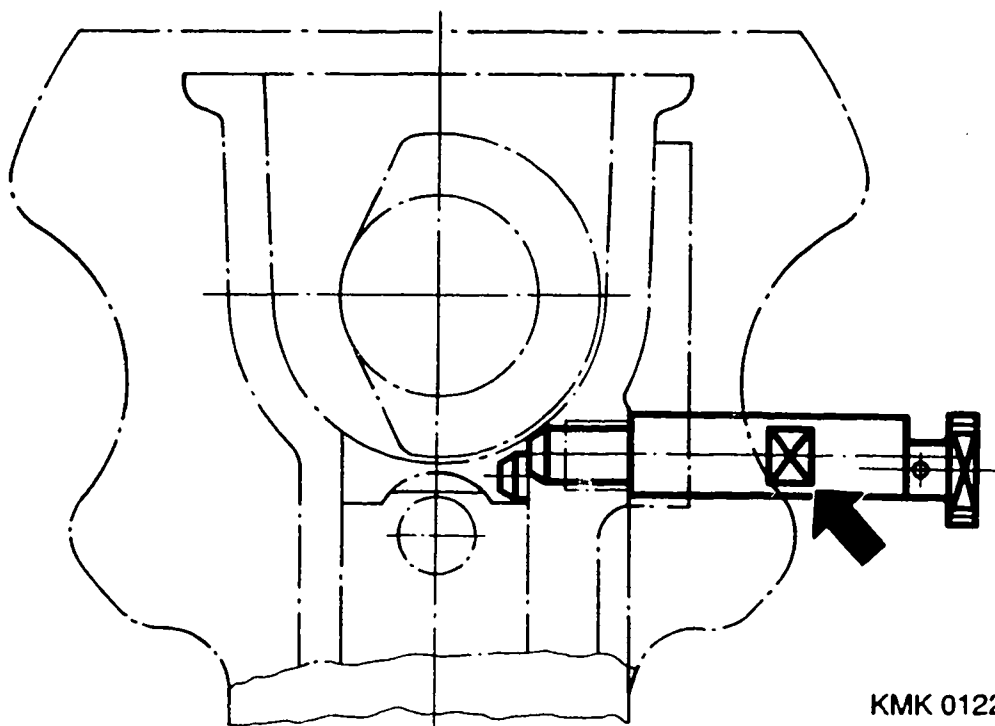
## FITTING TAPPET HOLDER

Before inserting tappet holder KDEP 1553, the respective roller tappet is to be set to TDC by turning the camshaft.

The hole in the pump housing for inserting the tappet holder is thus open.

Insert tappet holder into hole until it makes contact with the housing; turn camshaft slightly if necessary.

Continue: B12/1 Fig.: B11/2



KMK 01224

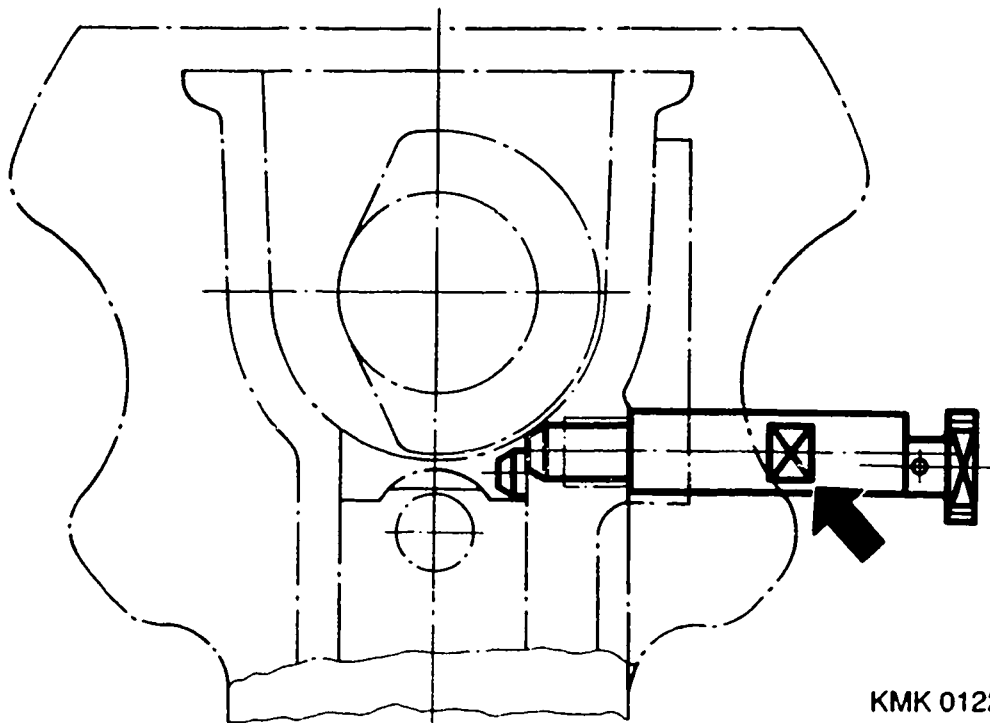
## FITTING TAPPET HOLDER

The "O" marks in the fixture body and on the end face of the modified handle point upwards (toward center of camshaft).

The milled keyways (arrow) on the side must be perpendicular.

After inserting the tappet holder, the eccentric shaft is to be turned through 180 degrees with a 16 mm wrench. This lifts the roller tappet off the cam. Always counter-hold at sleeve of tappet holder, so as to stop sleeve turning.

Continue: B13/1 Fig.: B12/2



KMK 01224

## REMOVING DRIVE COUPLING

Hold drive coupling with holding wrench  
KDEP 2885 and remove.

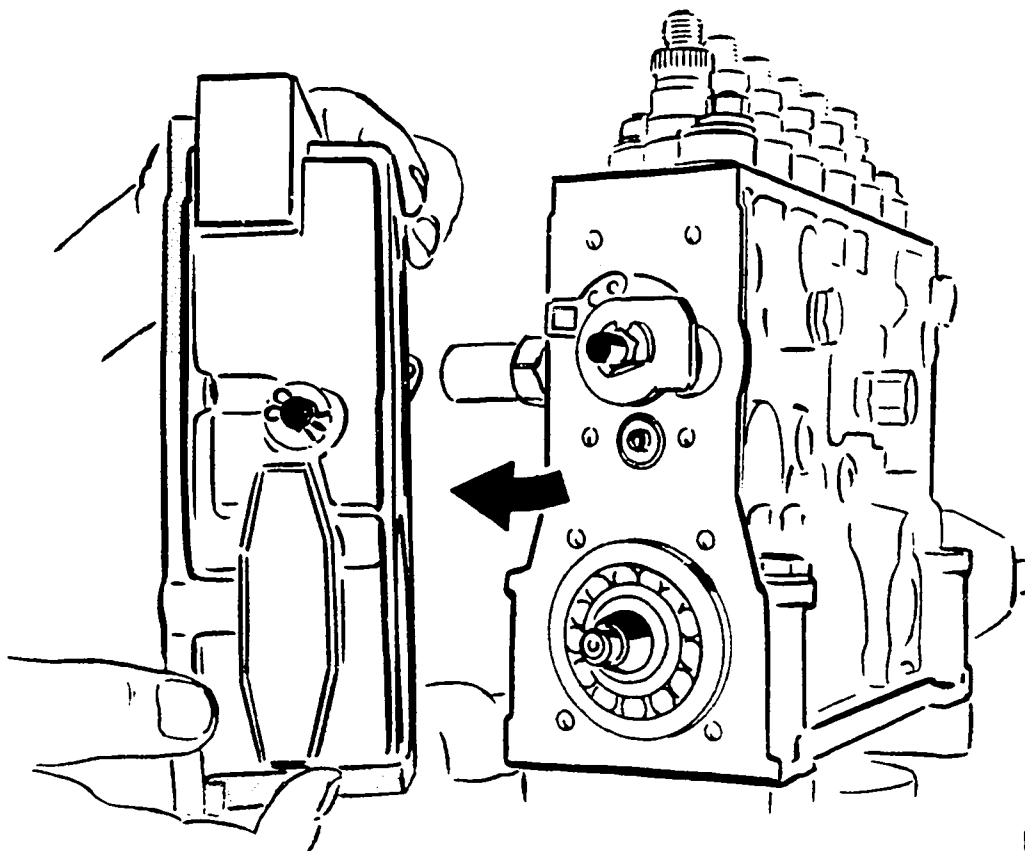
Continue: B14/1

## DISASSEMBLING GOVERNOR HOUSING

Loosen and screw out fastening screws  
of governor housing.

Remove governor housing; take off seal.

Continue: B15/1 Fig.: B14/2



KMK 01225

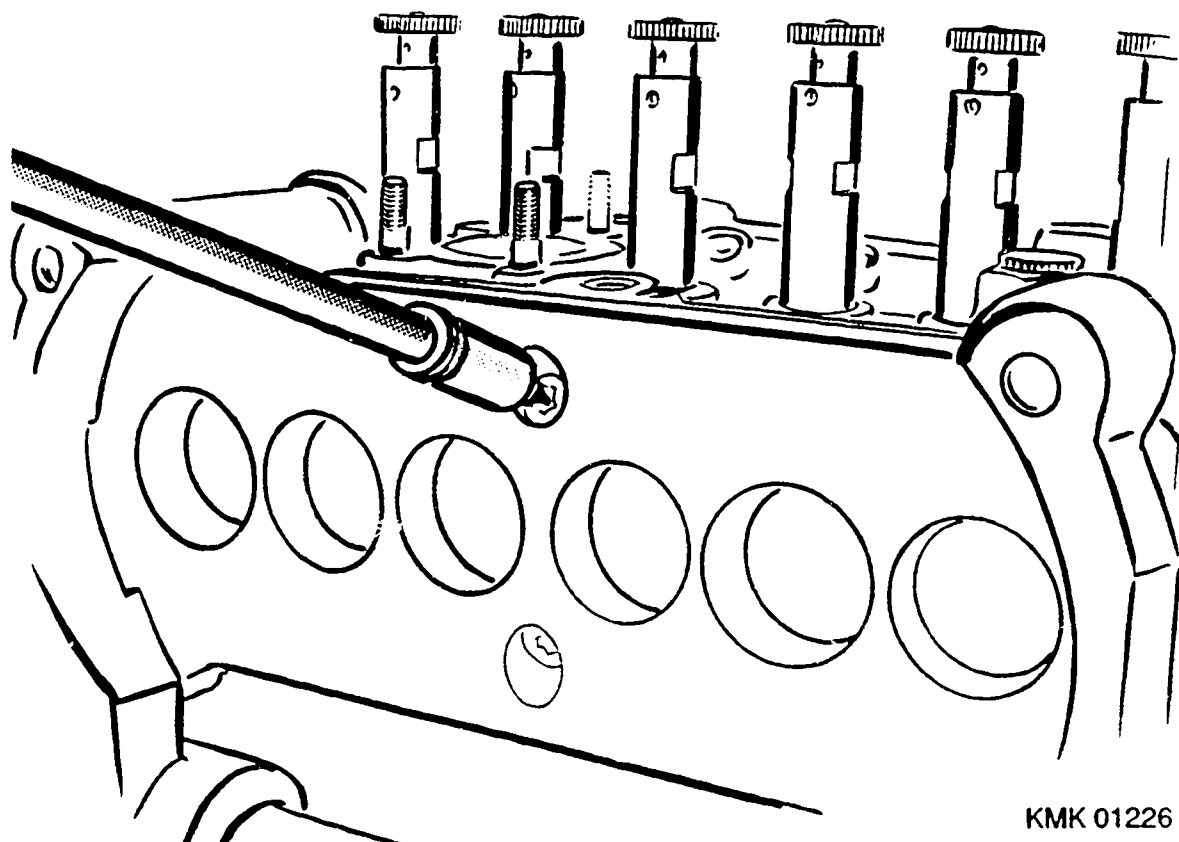
## REMOVAL OF CAMSHAFT

Loosen fastening screws of camshaft intermediate bearing and screw out. Remove resilient sleeves.

### Note:

Fastening screws are to be scrapped and replaced with new ones.

Continue: B16/1 Fig.: B15/2



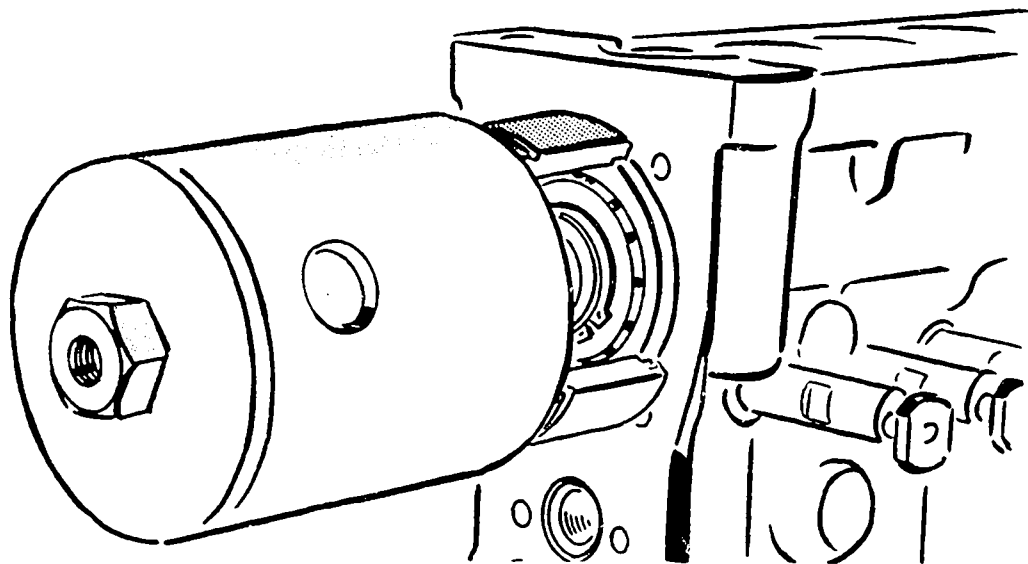
KMK 01226

REMOVAL OF CAMSHAFT  
— SELF-ALIGNING ROLLER BEARING

Insert two-piece spring collet of puller KDEP 1569 into annular groove at outer race of governor-end camshaft bearing.

Slip over bell-shaped part of puller until it makes contact with pump housing.

Continue: B17/1 Fig.: B16/2



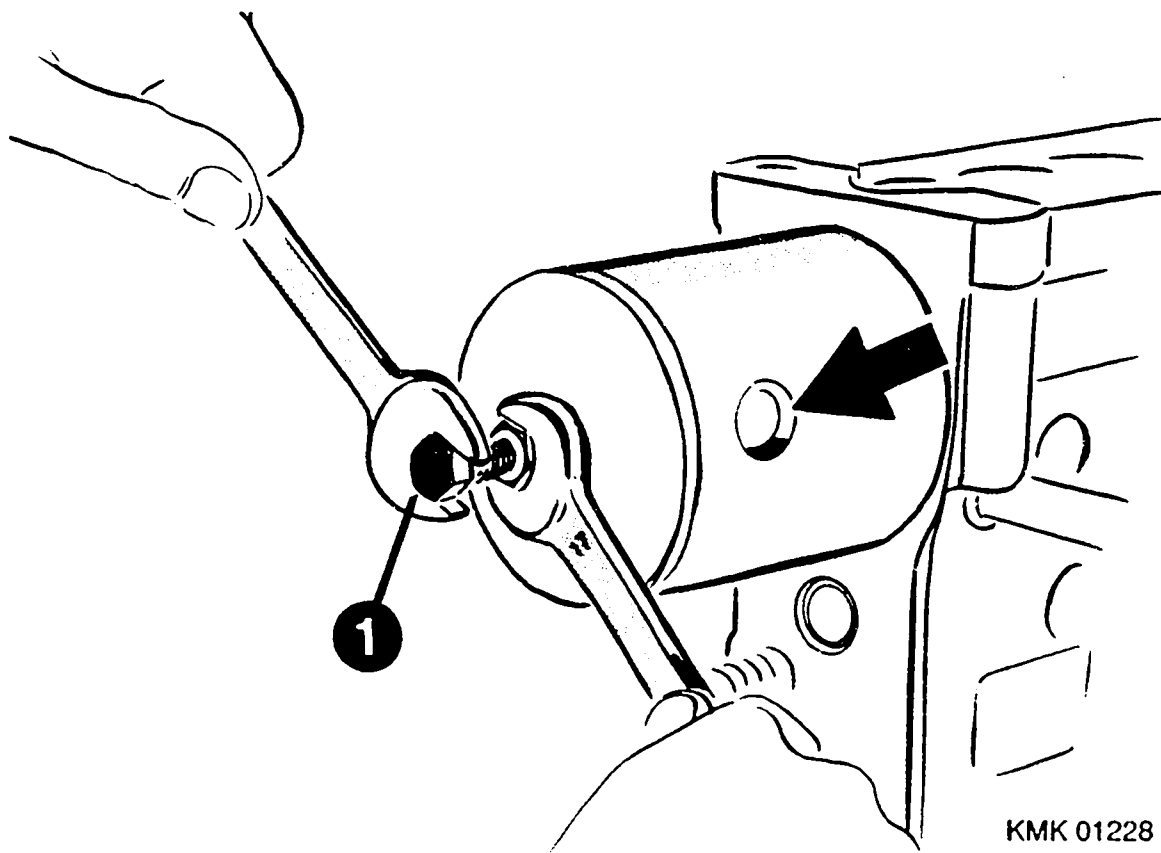
KMK 01227

## REMOVAL OF CAMSHAFT — SELF-ALIGNING ROLLER BEARING

Insert extractor screw with nut through central hole in bell-shaped part of puller KDEP 1569 and screw into support plate of inner collet. Check position through inspection hole in bell-shaped part (arrow).

To pull out bearing with camshaft, hold screw with wrench and turn extractor nut with second wrench (1).

Continue: B18/1 Fig.: B17/2



KMK 01228

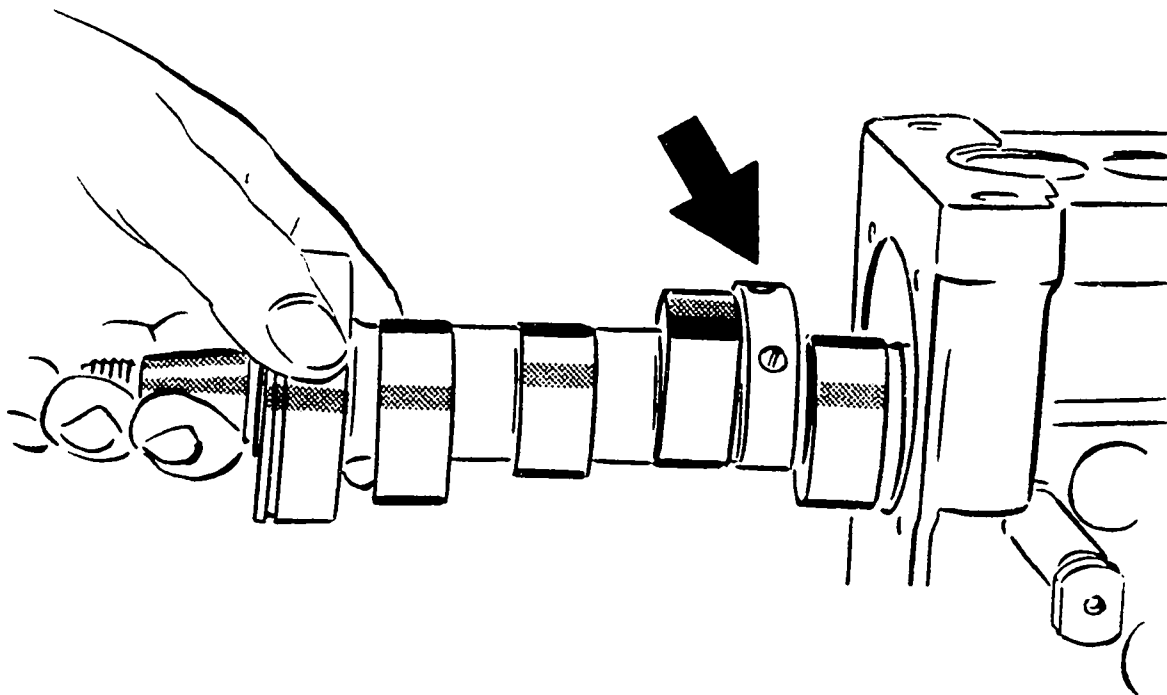
REMOVAL OF CAMSHAFT  
- SELF-ALIGNING ROLLER BEARING

Remove puller KDEP 1569 from camshaft bearing as soon as this has been pulled out of pump housing.

C A R E F U L L Y pull camshaft with bearing and intermediate bearing (arrow) out of pump.

Remove intermediate bearing from camshaft and set it down.

Continue: B19/1 Fig.: B18/2



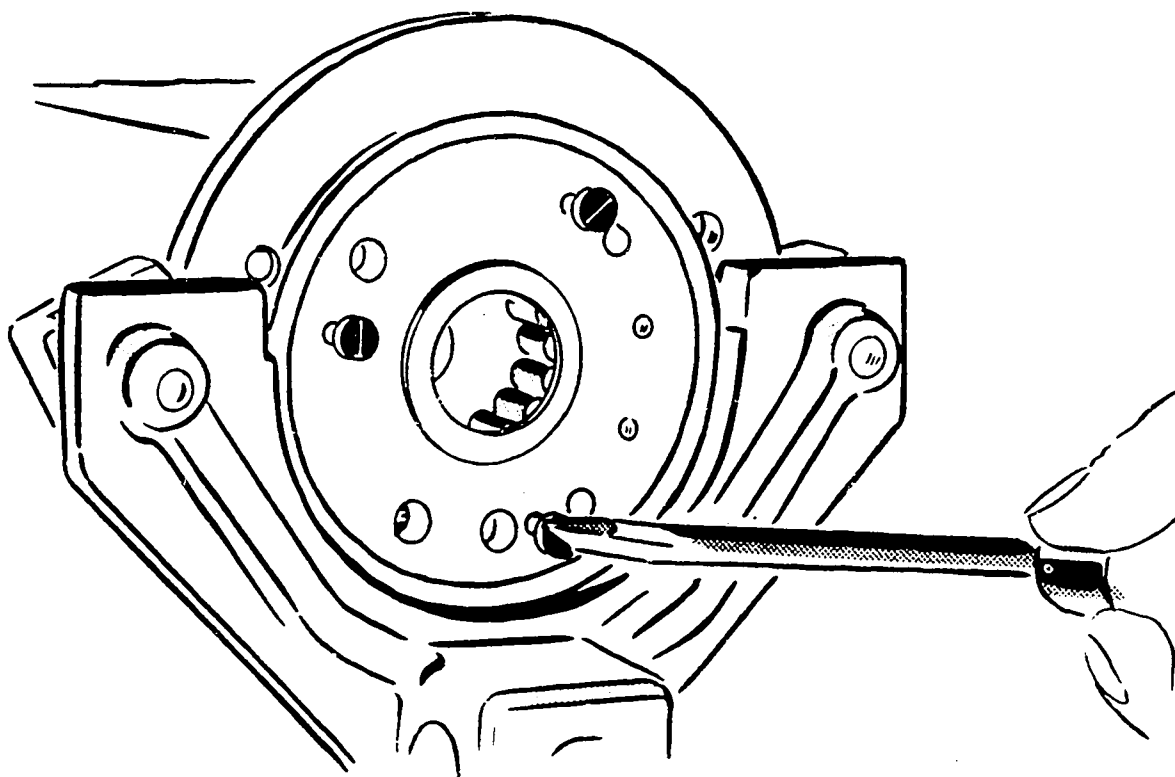
KMK 01229

REMOVAL OF CAMSHAFT  
— SELF-ALIGNING ROLLER BEARING

If there are tapped holes in the bearing end plate on the drive end, approx. 30 mm long screws with appropriate thread are to be screwed into them.

To press out the bearing end plate, continue turning the pressing-off screws inserted beforehand alternately and evenly until bearing end plate can be removed from pump housing.

Continue: B20/1 Fig.: B19/2

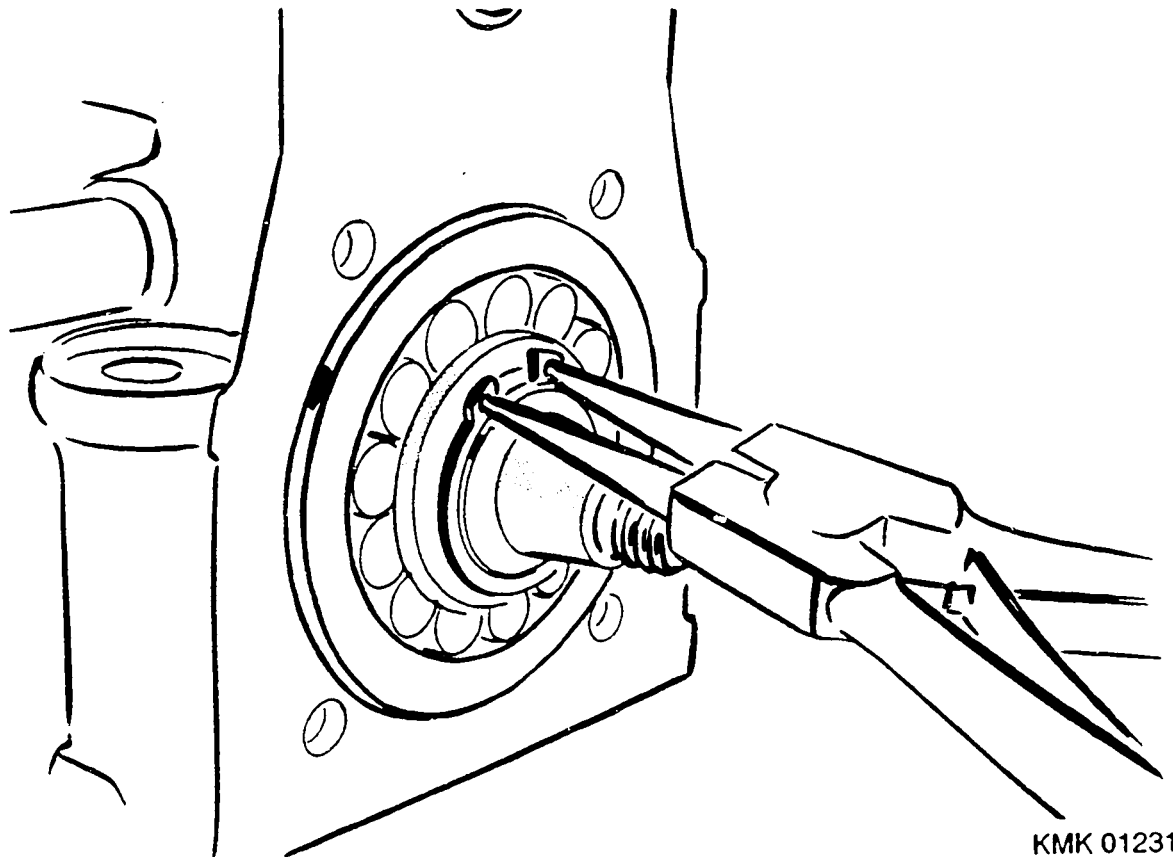


KMK 01230

REMOVAL OF CAMSHAFT  
- CYLINDRICAL-ROLLER BEARING

Remove retaining ring of camshaft  
bearing from camshaft.

Continue: B21/1 Fig.: B20/2

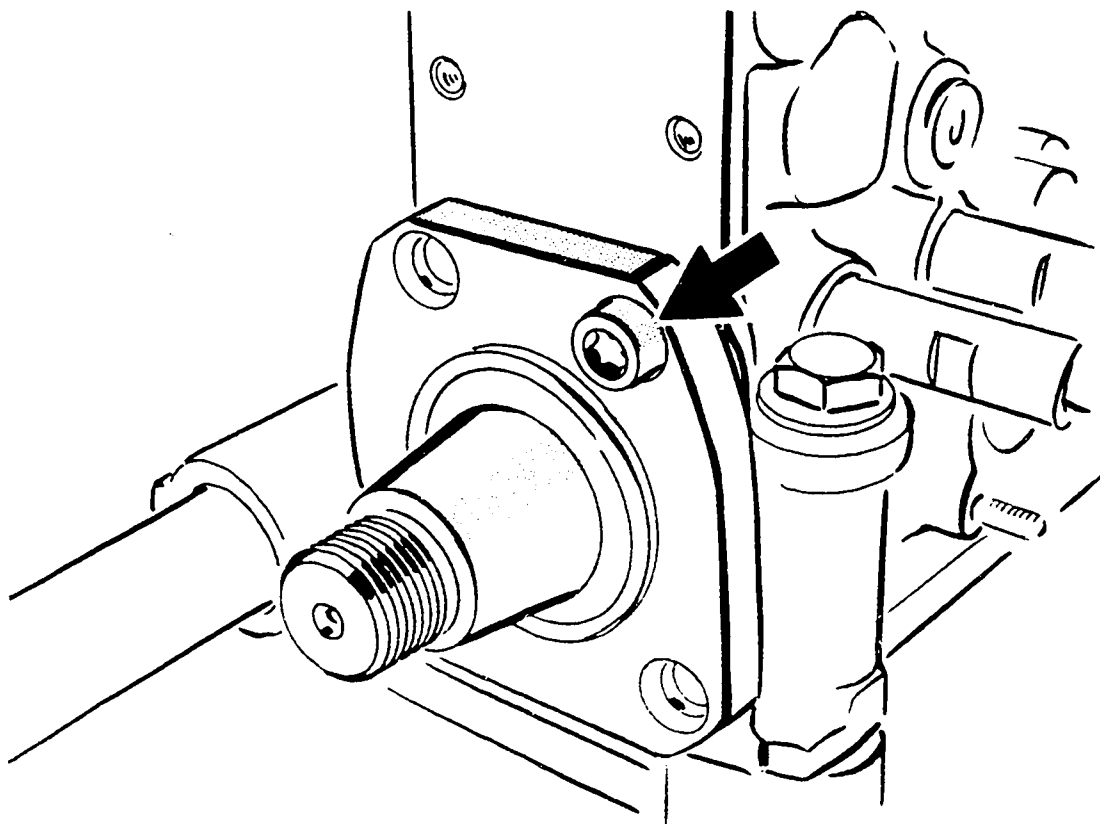


KMK 01231

REMOVAL OF CAMSHAFT  
— CYLINDRICAL-ROLLER BEARING

Loosen and screw out fastening screws  
(arrow) of bearing end plate.

Continue: B22/1 Fig.: B21/2

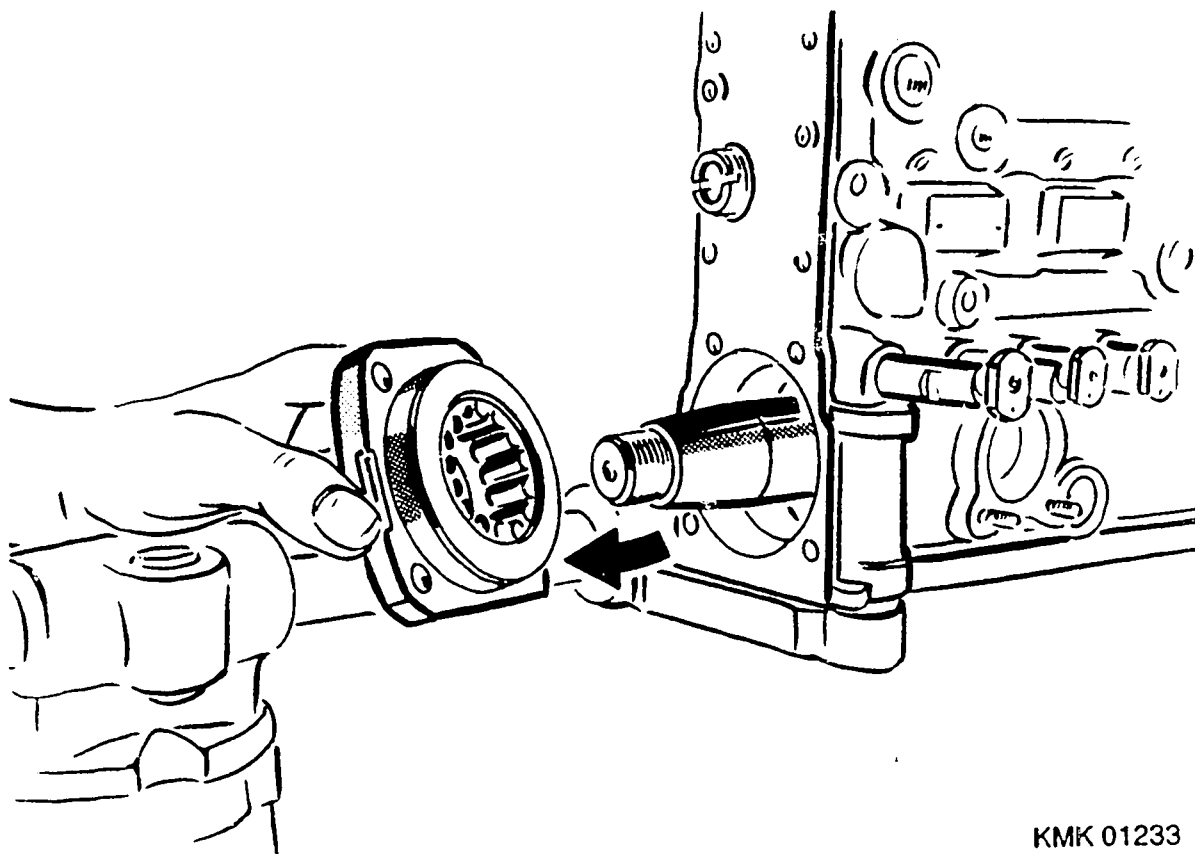


KMK 01232

REMOVAL OF CAMSHAFT  
- CYLINDRICAL-ROLLER BEARING

Remove bearing end plate.

Continue: B23/1 Fig.: B22/2

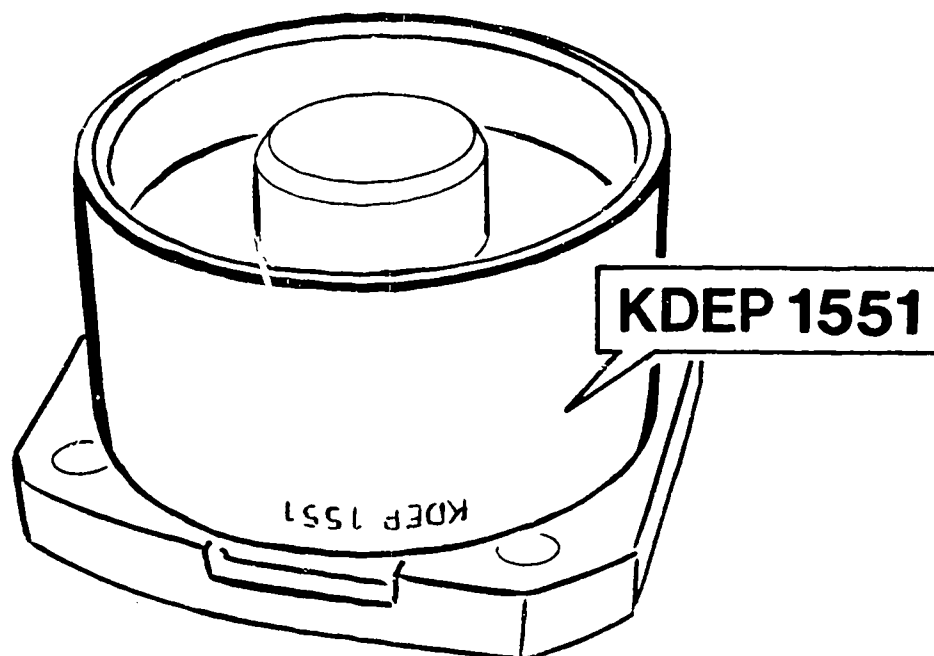


KMK 01233

**REMOVAL OF CAMSHAFT  
- CYLINDRICAL-ROLLER BEARING**

Attach KDEP 1551 to bearing end plate removed to guard against loss of bearing rollers.

Continue: B24/1 Fig.: B23/2



KMK 01234

**REMOVAL OF CAMSHAFT  
— CYLINDRICAL-ROLLER BEARING**

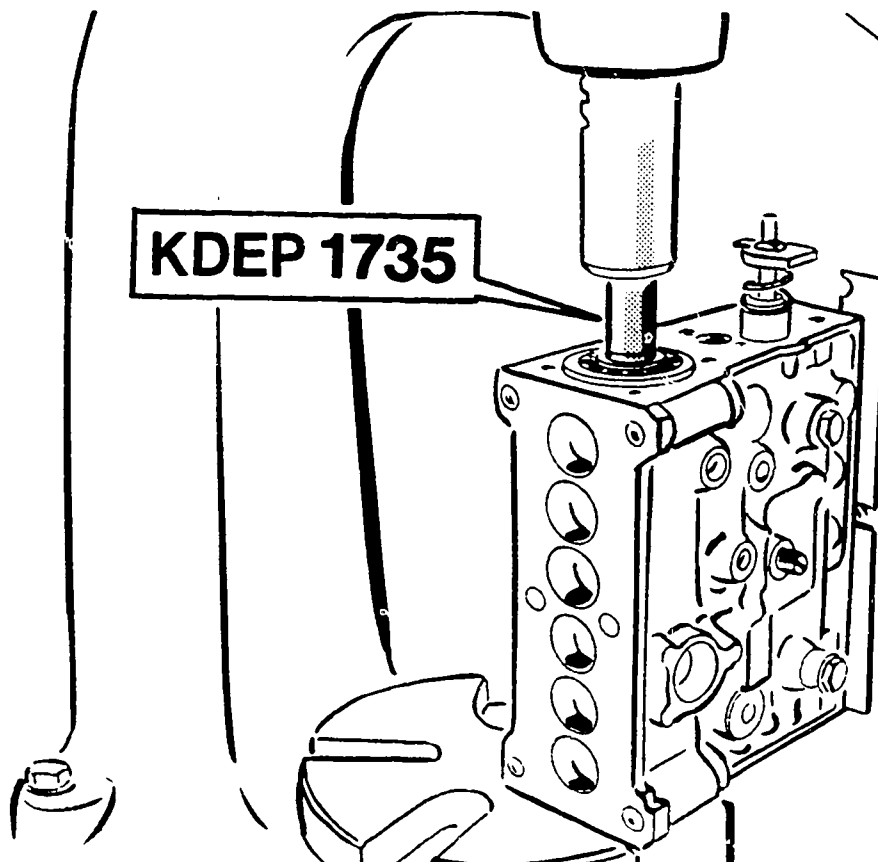
Position drive end of pump on screw press.

Attach KDEP 1735 to camshaft on governor end and press out camshaft.

**C A R E F U L L Y** remove camshaft from pump housing.

Remove intermediate bearing from camshaft and set it down.

Continue: B25/1 Fig.: B24/2



KMK 01235

## REMOVAL OF CAMSHAFT - CYLINDRICAL-ROLLER BEARING

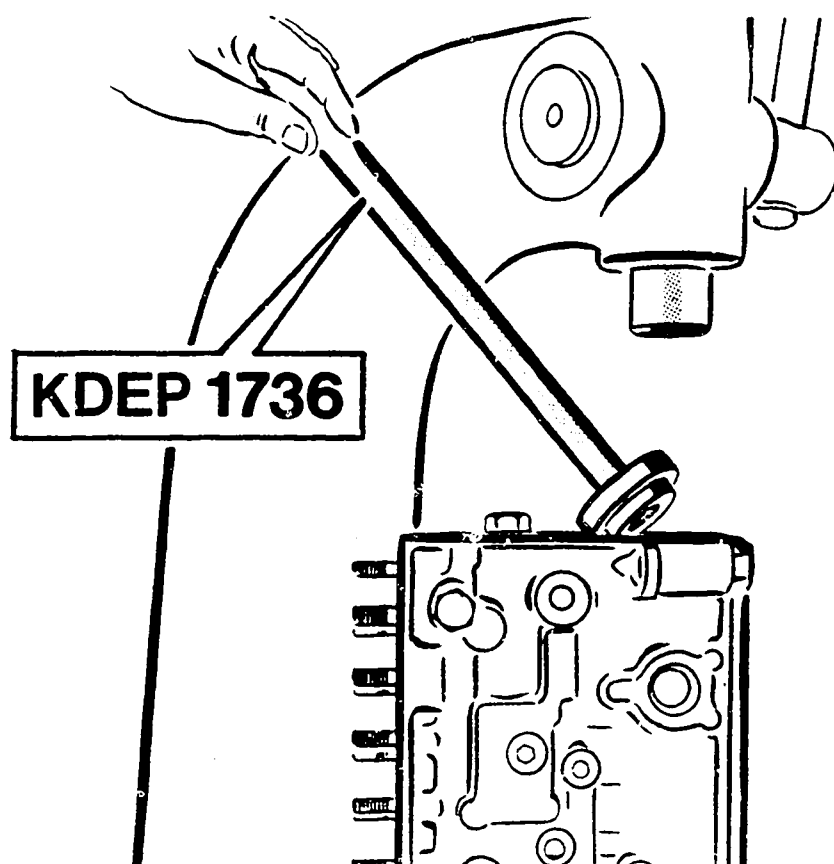
Turn pump housing around and position it on governor end. Insert KDEP 1736 into camshaft chamber and press outer race of roller bearing out of pump housing.

(Pay attention to exact position of pressing-out disk !!!)

### Note:

The pressing-out procedure described deforms the governor-end roller bearing. A N E W roller bearing is therefore to be used.

Continue: B26/1 Fig.: B25/2



KMK 01236

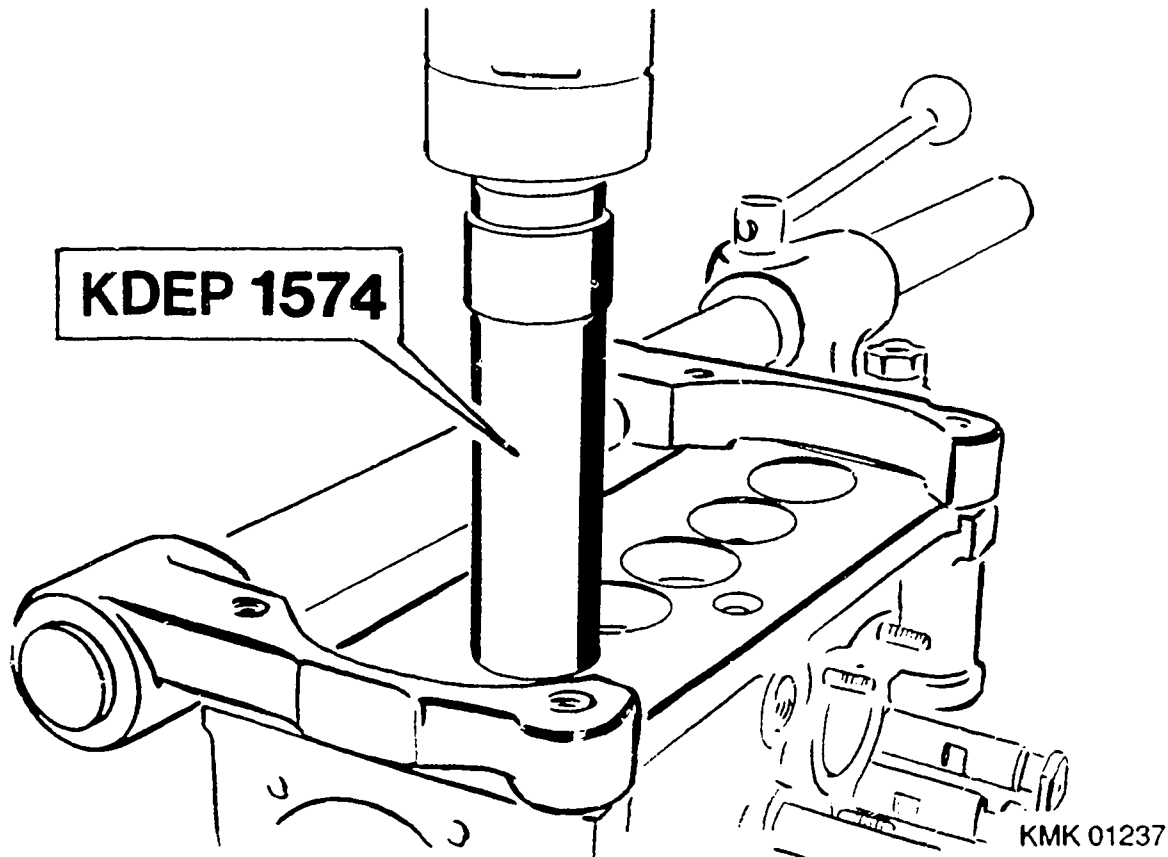
## REMOVING END COVERS

Use pressing-in mandrel KDEP 1574 to knock end covers inwards into camshaft chamber of pump housing and remove.

### Note:

This operation destroys the end covers and they must be renewed.

Continue: B27/1 Fig.: B26/2



## ROLLER-TAPPET REMOVAL

Safety measure:

The procedure outlined in the Section "ROLLER-TAPPET REMOVAL" must be implemented with extreme caution. When carrying out this operation, there is a possibility of sudden tappet-spring release and thus a DANGER OF INJURY !

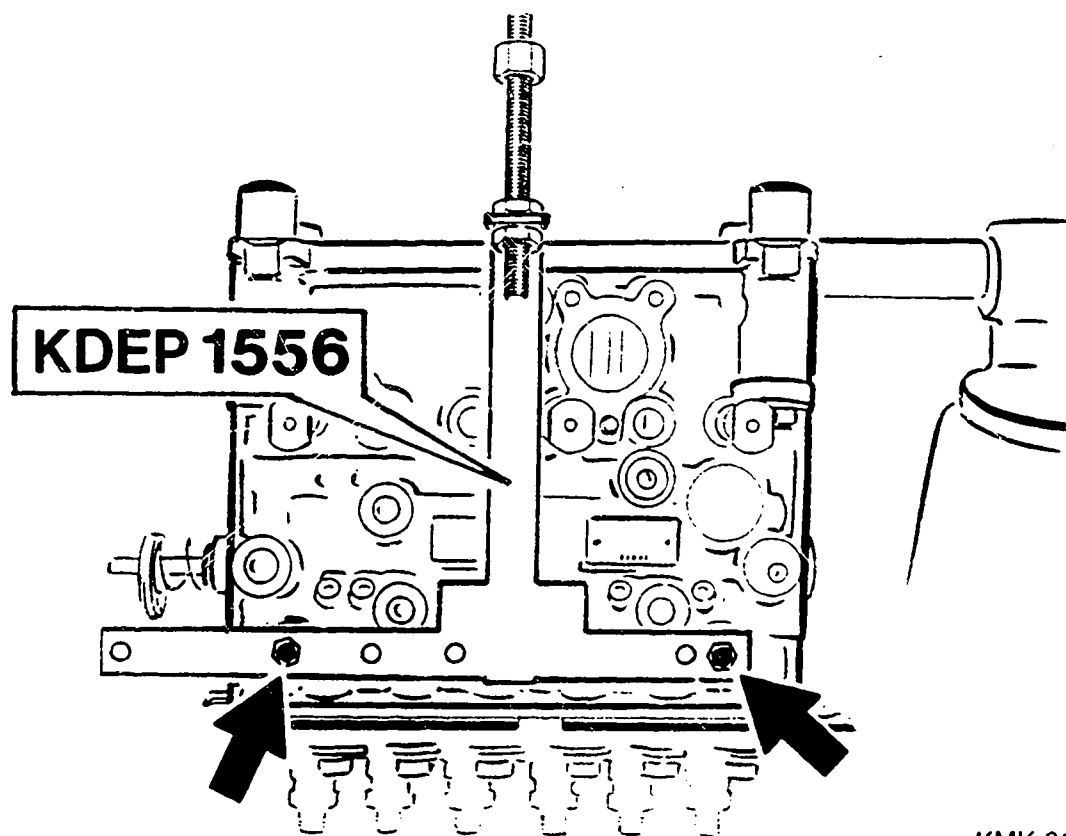
Continue: B28/1

## ROLLER-TAPPET REMOVAL

Attach assembly device KDEP 1556 to pump housing.

To do so, screw the fastening screws (arrows) into the tapped holes of the fuel supply/return line and tighten.

Continue: C01/1 Fig.: B28/2



KMK 01238

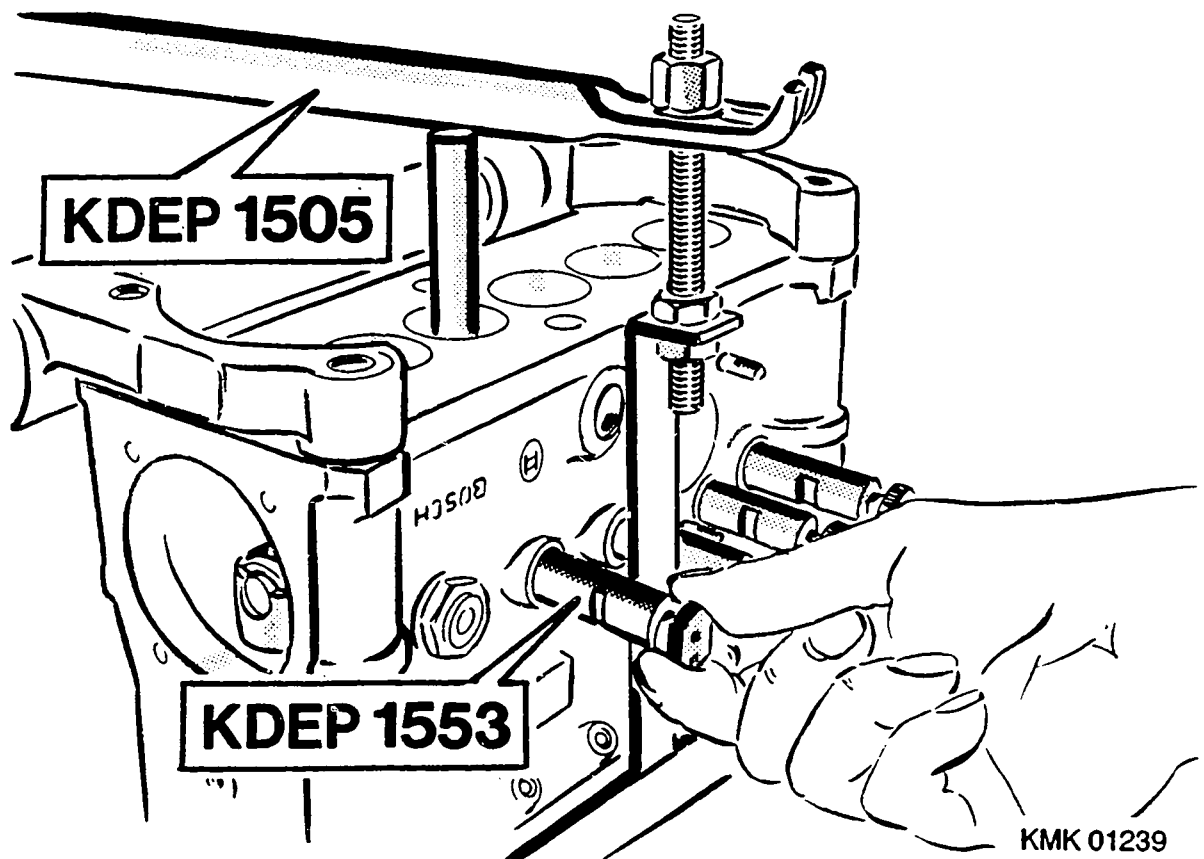
## ROLLER-TAPPET REMOVAL

Attach tubular lever of assembly device KDEP 1505 to retaining pin of assembly device KDEP 1556.

Attach thrust pin to roller of first roller tappet and press lever downwards as far as it will go.

Remove tappet holder KDEP 1553 and set it down.

Continue: C02/1 Fig.: C01/2



KMK 01239

## ROLLER-TAPPET REMOVAL

Carefully move tubular lever of assembly device up again and thus release the tappet spring.

This procedure is to be repeated for each pump tappet.

Remove assembly device KDEP 1556 again.

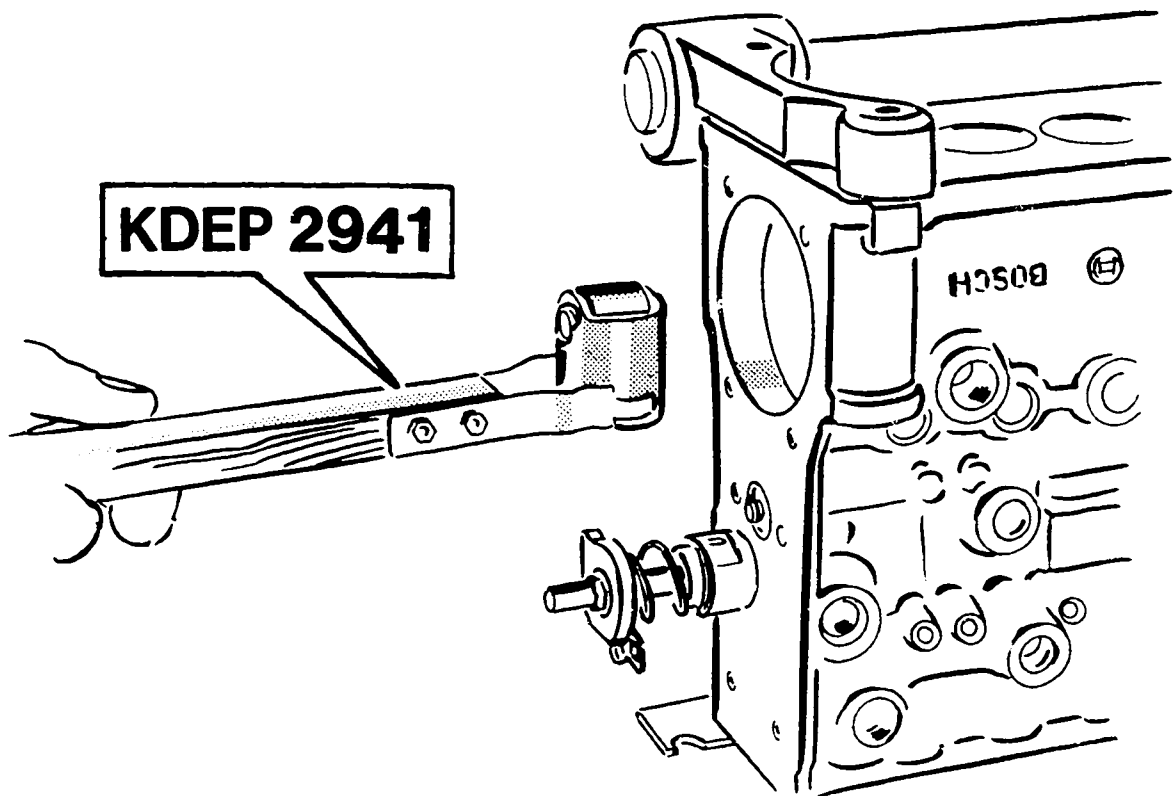
Continue: C03/1

## ROLLER-TAPPET REMOVAL

Remove roller tappet.

This procedure is to be repeated for each pump barrel.

Continue: C04/1 Fig.: C03/2



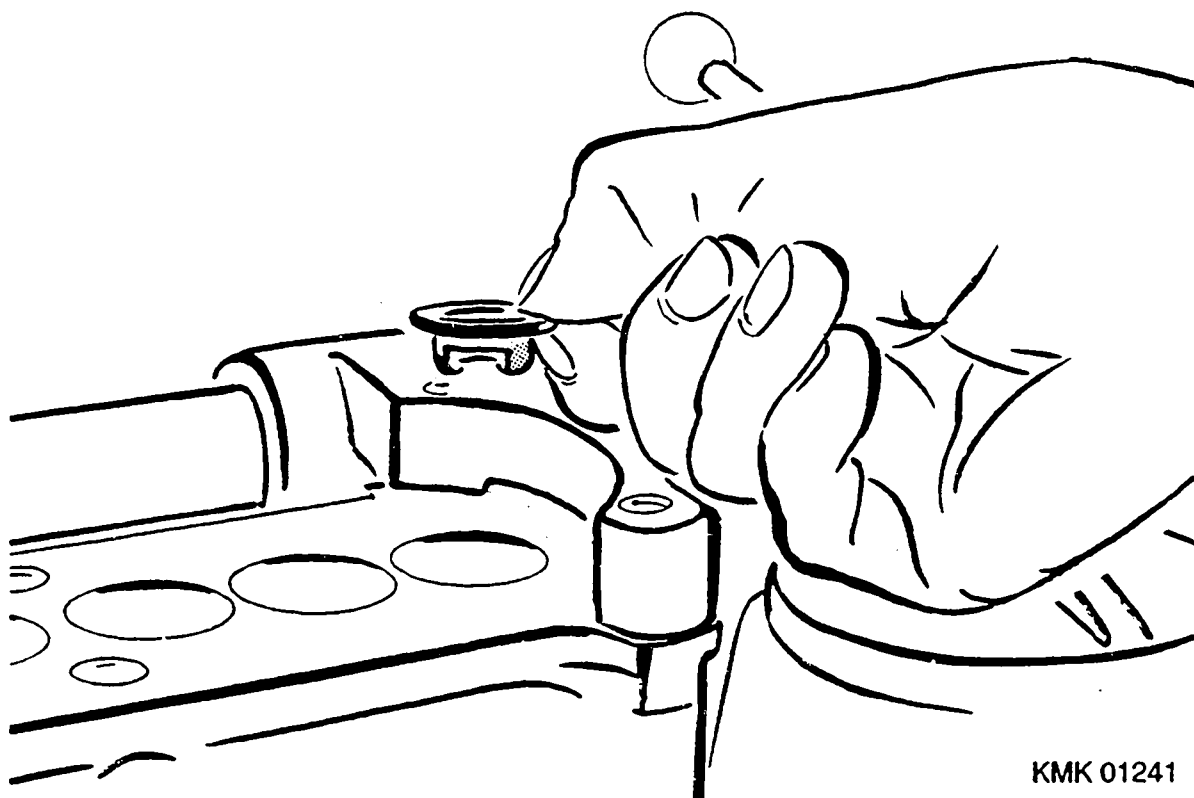
KMK 01240

## REMOVING LOWER SPRING SEAT

Remove lower spring seat.

This procedure is to be repeated for each pump barrel.

Continue: C05/1 Fig.: C04/2



KMK 01241

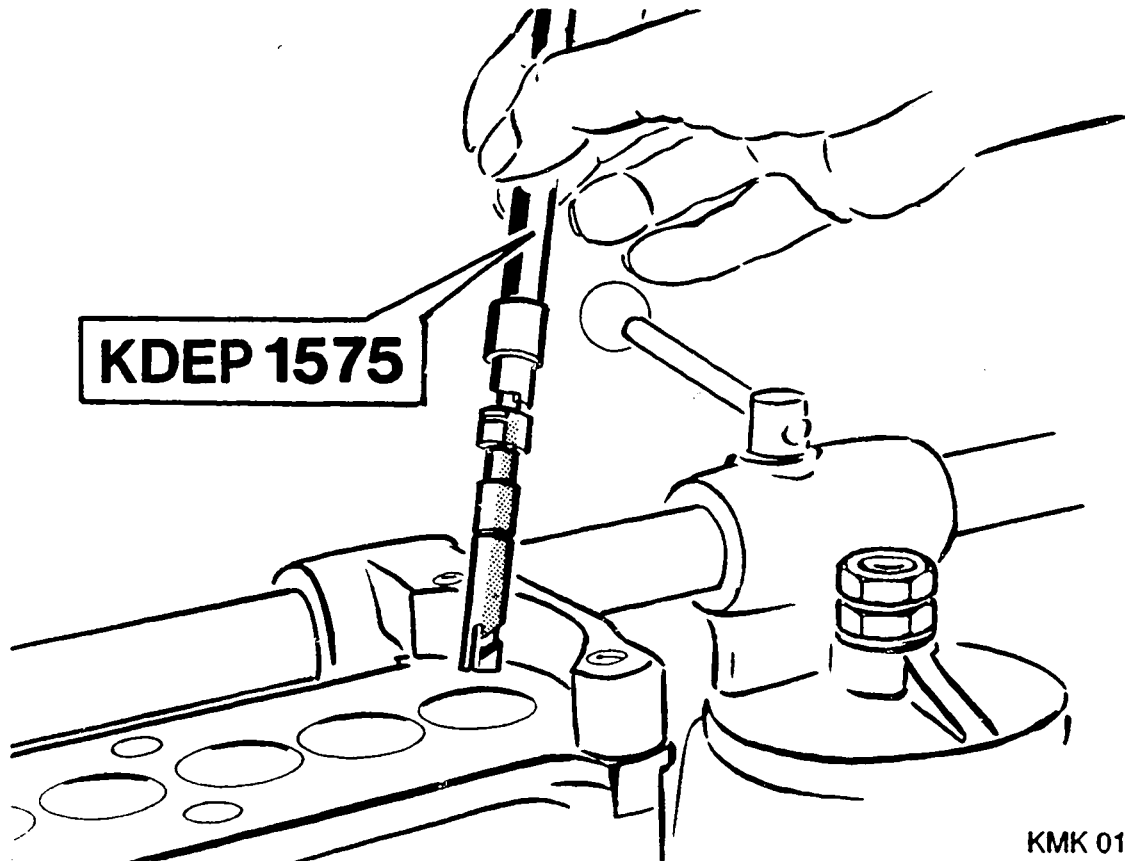
## REMOVING PUMP PLUNGER

Pull pump plunger out of pump barrel with special pliers KDEP 1575 and set it down.

**!!! CAUTION !!!**

Pump plungers are not to be mixed up, i.e. jointly set down all component parts belonging to one barrel.

Continue: C06/1 Fig.: C05/2



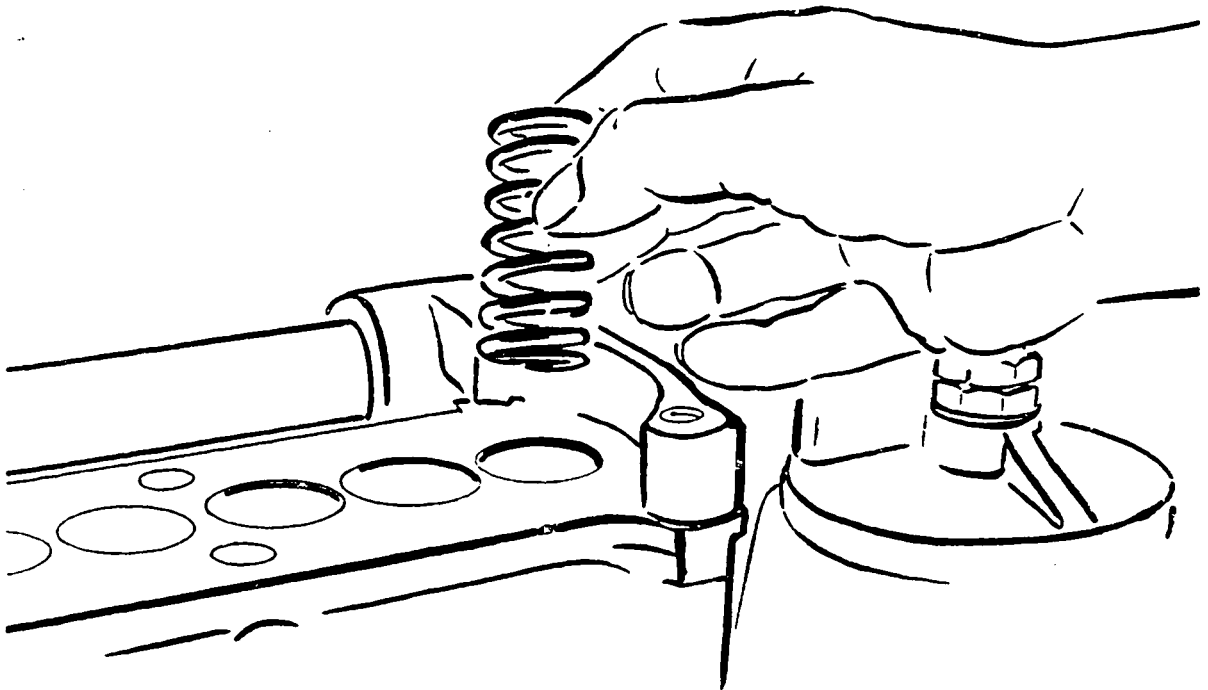
KMK 01242

## REMOVING TAPPET SPRING

Remove tappet spring.

This procedure is to be repeated for each pump barrel.

Continue: C07/1 Fig.: C06/2



KMK 01243

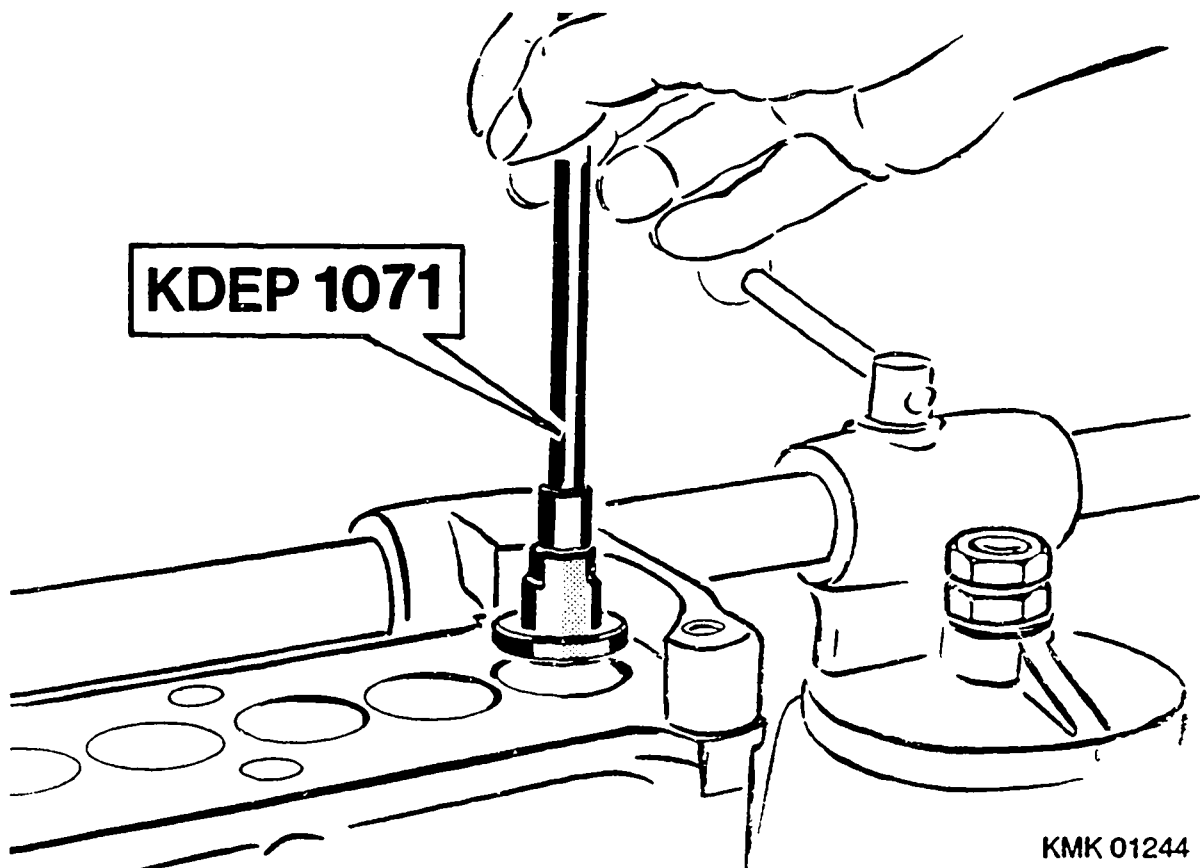
## REMOVING CONTROL SLEEVE AND SPRING SEAT

Use wrench KDEP 1071 to remove control sleeve and upper spring seat.

In doing so, control rod must be in center position.

This procedure is to be repeated for each pump barrel.

Continue: C08/1 Fig.: C07/2



KMK 01244

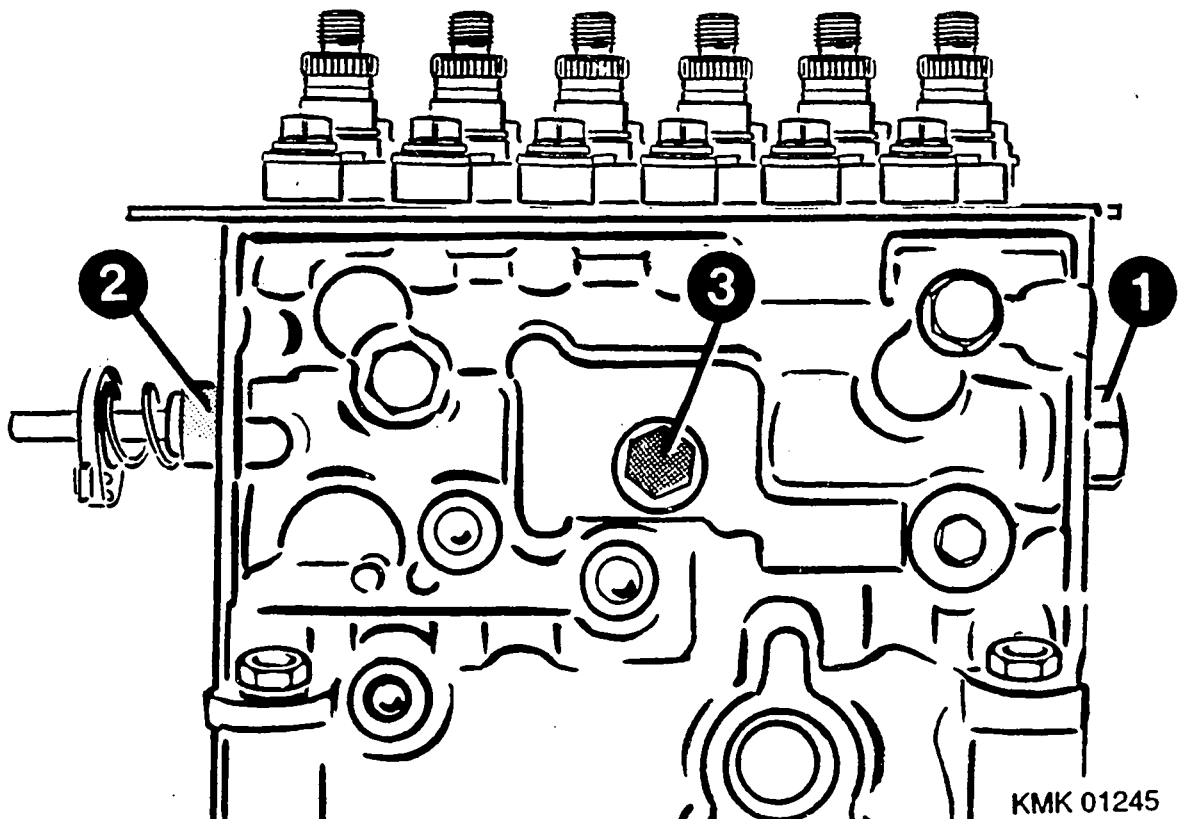
## REMOVING CONTROL ROD (RE-POSITIONER)

Unscrew control-rod screw plug (1).

Loosen control-rod nut (2) and pull control rod out of pump on governor end.

Loosen cap and lock nut (3) of control-rod guide screw and screw off.

Continue: C09/1 Fig.: C08/2



KMK 01245

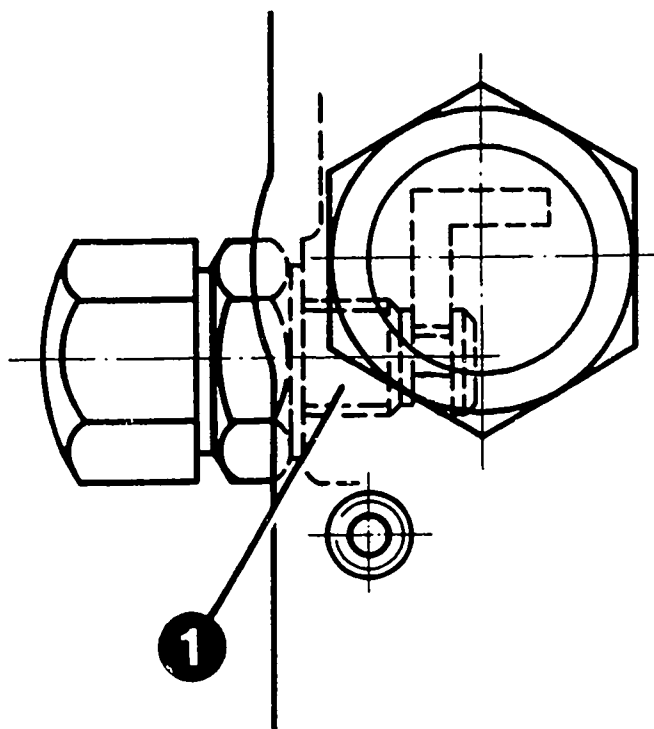
## REMOVING CONTROL ROD (RE-POSITIONER)

Screw out control-rod guide screw (1).

### Note:

The control-rod guide screw cannot be screwed out U N T I L the control rod has been removed.

Continue: C10/1 Fig.: C09/2

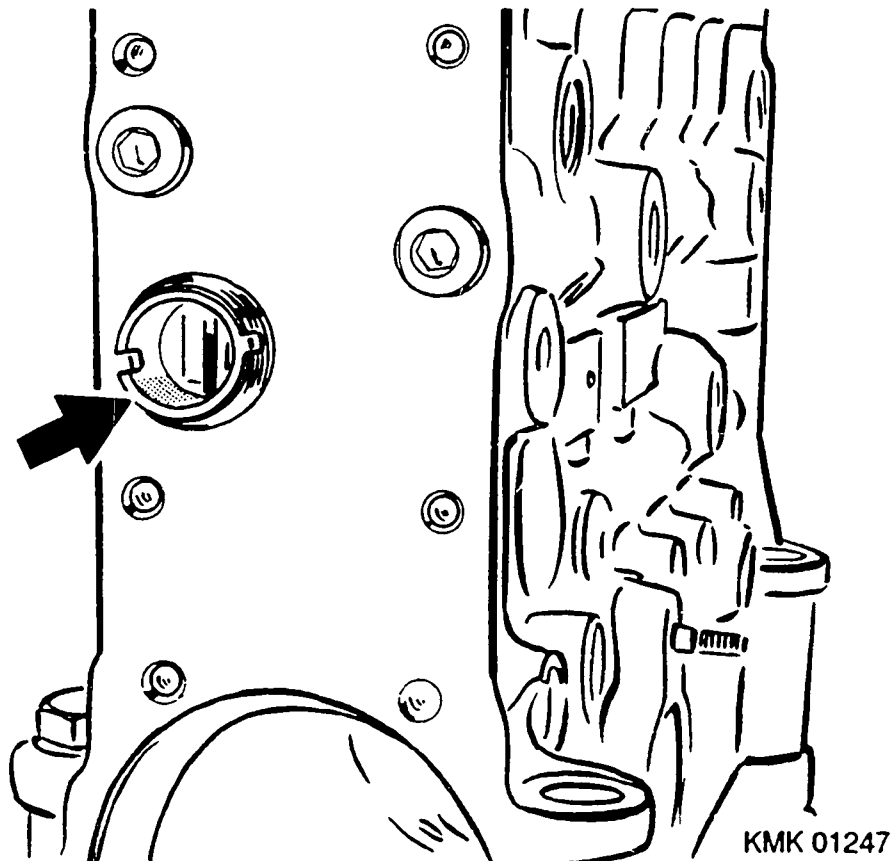


KMK 01246

## REMOVING CONTROL ROD (RE-POSITIONER)

Screw threaded ring (arrow) out using  
pin-type socket wrench KDEP 1577.

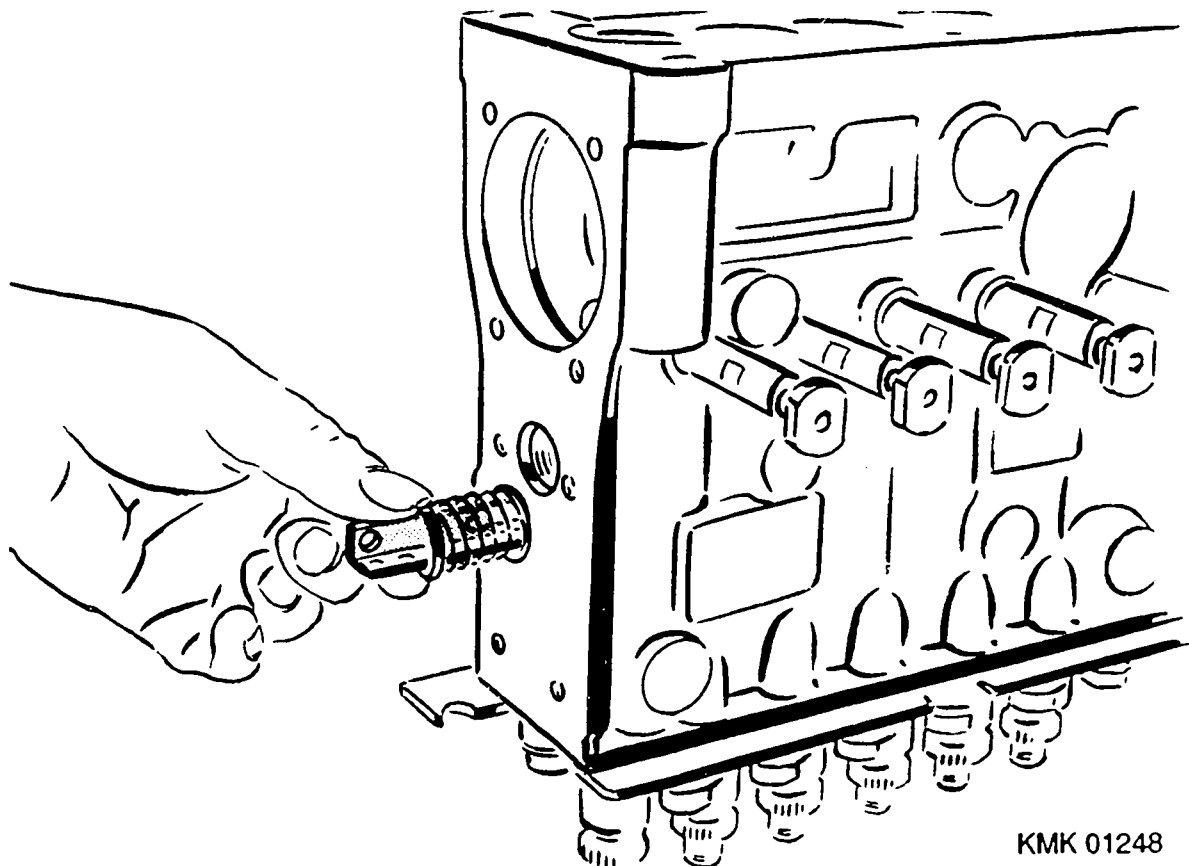
Continue: C11/1 Fig.: C10/2



## REMOVING CONTROL ROD (MECHANICAL GOVERNOR)

Remove spring seat and play-compensating spring from control rod on governor end.

Continue: C12/1 Fig.: C11/2



KMK 01248

## REMOVING CONTROL ROD (MECHANICAL GOVERNOR)

Screw out threaded ring with pin-type socket wrench KDEP 1577 (picture a).

Remove positioning pin (picture b - arrow).

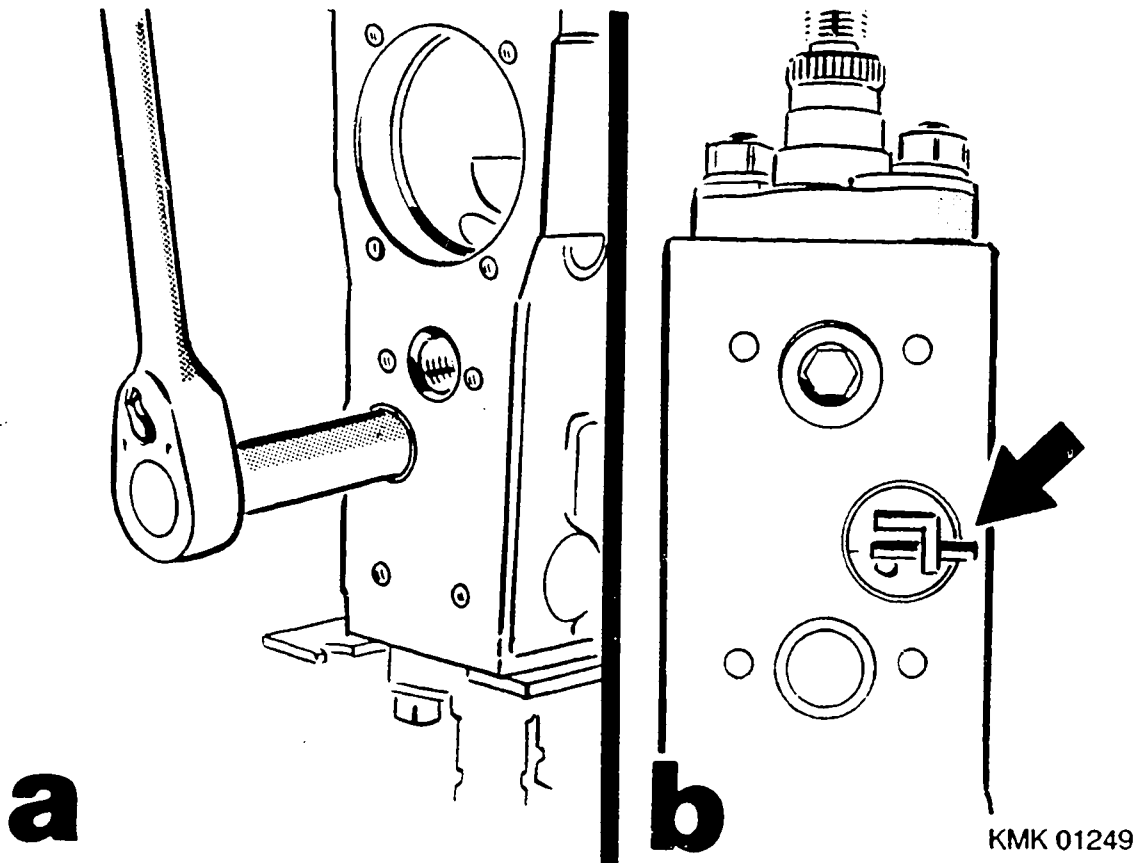
Pull out control rod away from drive end.

Remove control-rod screw plug on drive end and take out guide bushing.

### Note:

If guide bushing sticks, press it out away from drive end with long mandrel.

Continue: C13/1 Fig.: C12/2



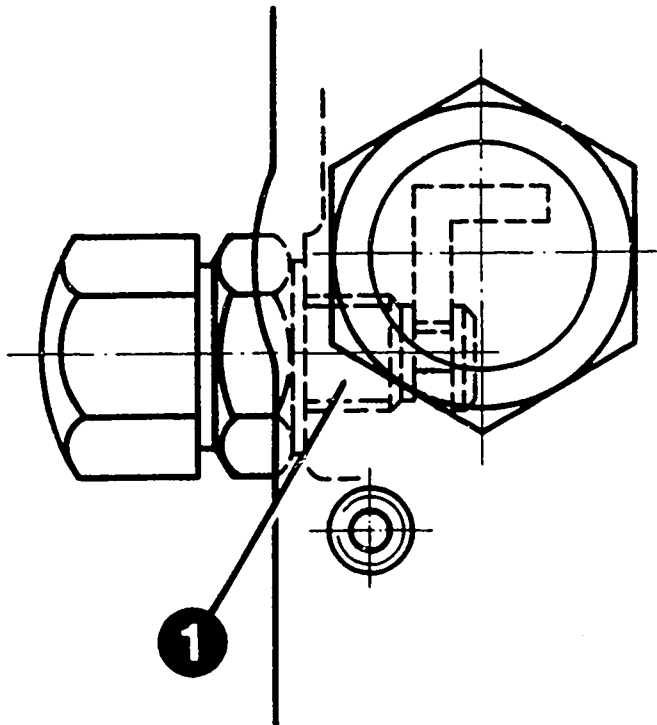
## REMOVING CONTROL ROD (MECHANICAL GOVERNOR)

Screw out control-rod guide screw (1).

### Note:

The control-rod guide screw cannot be screwed out U N T I L the guide rod has been removed.

Continue: C14/1 Fig.: C13/2



KMK 01246

## REMOVING BARREL-AND-FLANGE ELEMENT

Unscrew hexagon nut of barrel-and-flange elements and pull out/set down spacers KDEP 1550 beneath the flanges.

Attach spacer sleeves KDEP 2911/3 to support pins of puller KDEP 2911. Use this to pull barrel-and-valve assemblies out of pump housing.

Continue: C14/2

## REMOVING BARREL-AND-FLANGE ELEMENT

### Note:

When setting down the barrel-and-valve assemblies, pay attention to same sequence as that for removal of pump plungers.

Deliver-valve holder, pump plunger and pump barrel in barrel-and-valve assembly must not be mixed up.

Continue: C15/1

## DISASSEMBLING BARREL-AND-FLANGE ELEMENT

### Safety measure:

The procedure outlined in the Section "DISASSEMBLING BARREL-AND-FLANGE ELEMENT" must be implemented with extreme caution. When carrying out this operation, there is a possibility of the snap ring breaking on disassembly of the plunger-and-barrel assembly and thus a DANGER OF INJURY !

Continue: C16/1

## DISASSEMBLING BARREL-AND-FLANGE ELEMENT

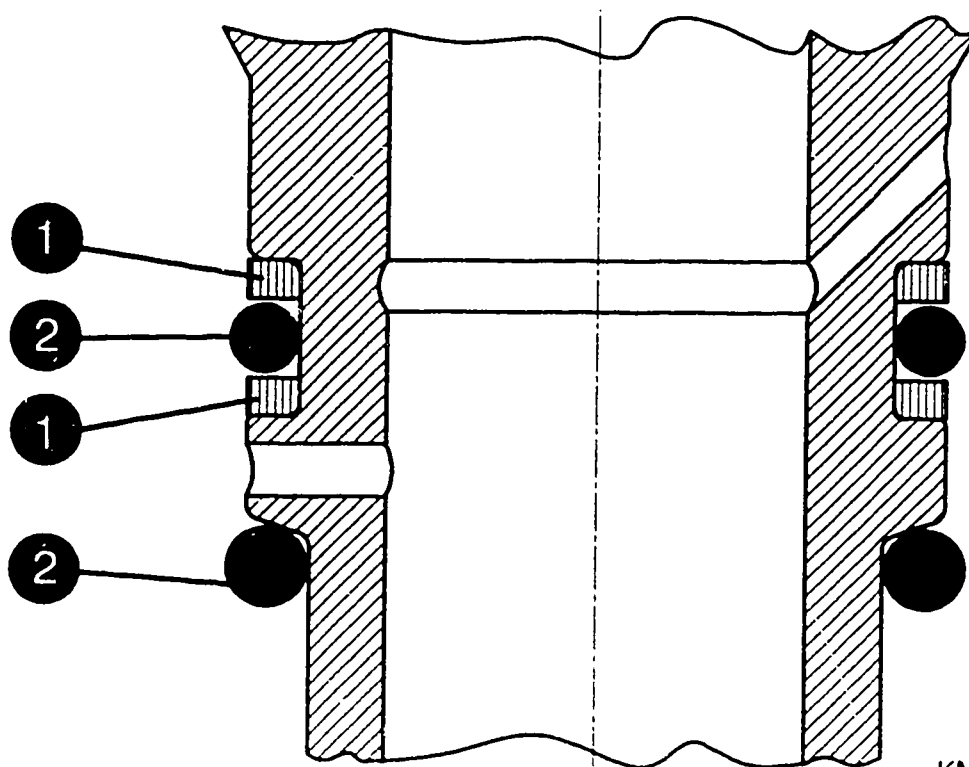
Remove snap ring with "pliers for retaining-ring shaft" from plunger-and-barrel assembly and take off impact cap.

If appropriate, remove support rings (1) and take off O-rings (2).

### Note:

Snap ring, support rings and O-rings are to be replaced with new ones.

Continue: C17/1 Fig.: C16/2



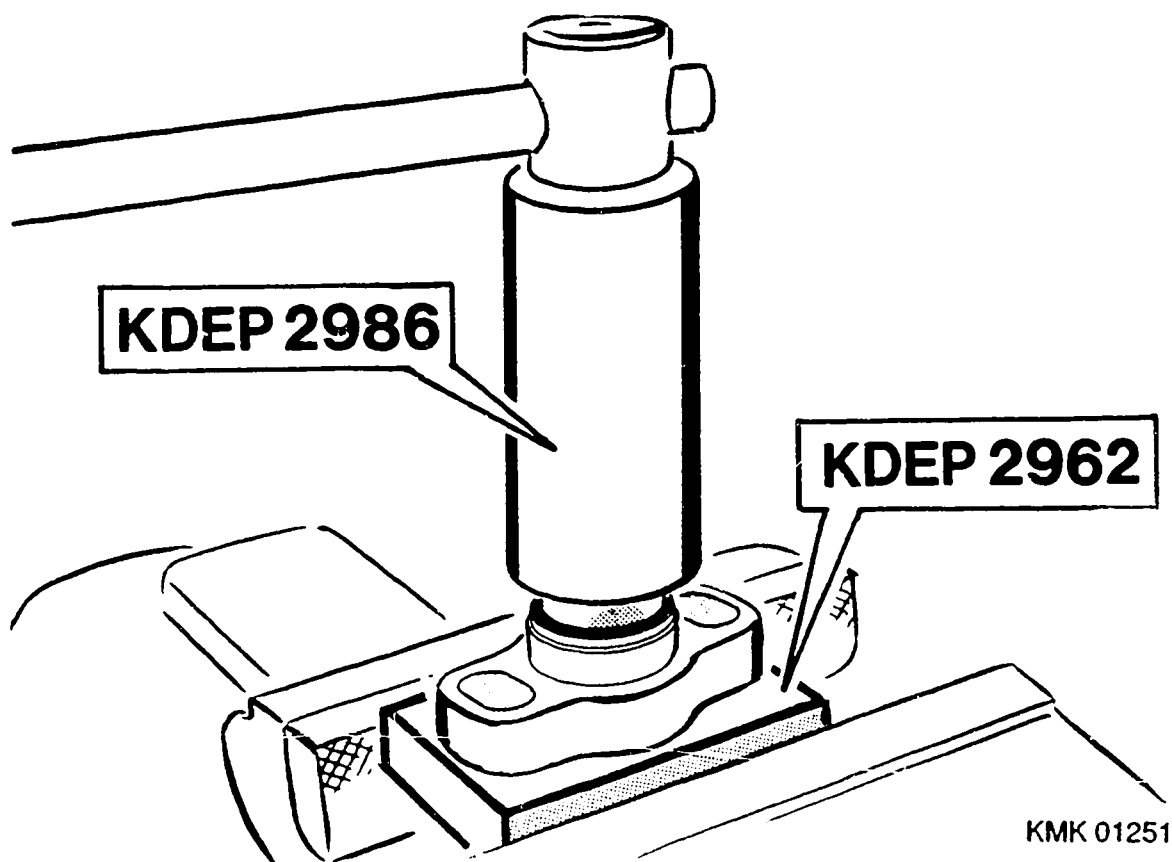
KMK01250

## DISASSEMBLING BARREL-AND-FLANGE ELEMENT

Position barrel-and-valve assembly in assembly device KDEP 2962.

Loosen delivery-valve holder with socket wrench KDEP 2986 and screw out.

Continue: C18/1 Fig.: C17/2



## DISASSEMBLING BARREL-AND-FLANGE ELEMENT

Remove valve spring with spring seat or filler piece from delivery-valve holder.

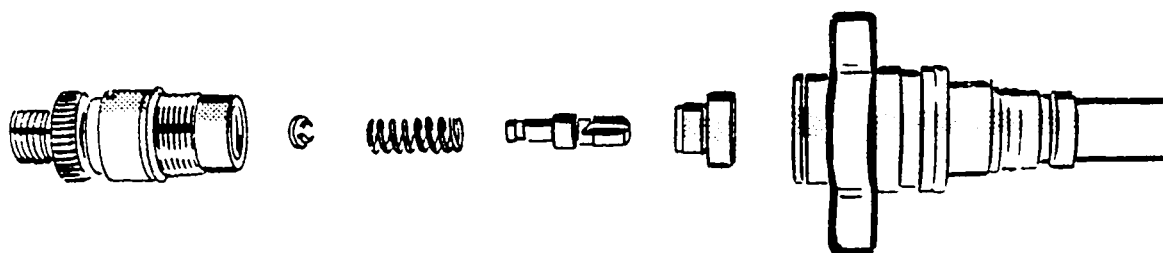
Remove O-ring from delivery-valve holder.

Take constant-pressure valve out of pump barrel.

### Note:

There is no seal between pump barrel and delivery valve on series P-8000 fuel-injection pumps.

Continue: C19/1 Fig.: C18/2



KMK 01252

## CLEANING OF PARTS

Wash out parts in commercially available cleaning agent, such as chlorothene NU, which is not readily flammable.

Pay attention to the following safety regulations !!!

In Germany:

Order Governing Work with Combustible Liquids (Vbf) as published by Federal Labor Ministry (BmA).

Continue: C19/2

## CLEANING OF PARTS

Safety regulations for handling chlorinated hydrocarbons

Companies ZH 1 / 222

Employees ZH 1 / 119

as published by the Hauptverband für Gewerbliche Berufsgenossenschaften (Zentralverband für Unfallschutz und Arbeitsmedizin), Langwartweg 103, 5300 Bonn 5, Germany.

As regards other countries, attention is to be paid to the appropriate local legislation.

Continue: C20/1

## CLEANING OF PARTS

Re-cut tapped fastening holes in pump housing for intermediate bearing and governor housing with tap, and then wash and blow out holes.

Continue: C21/1

## CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

Renew parts which are worn or damaged.

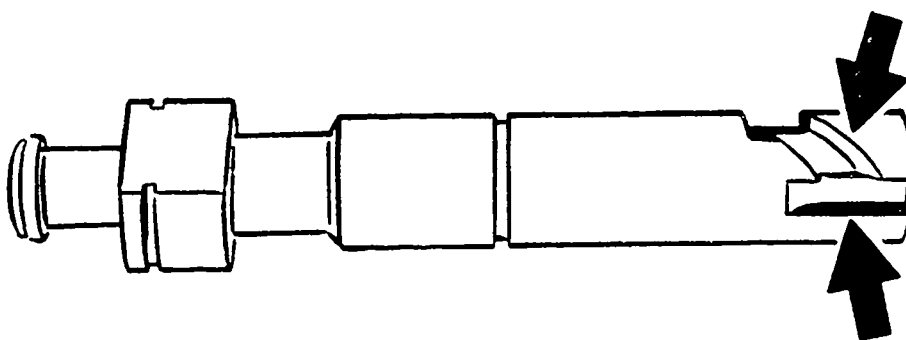
Always renew packing disks, O-rings and snap rings.

Pay particular attention to helices of pump plungers.

The helices must feature sharp edges and must not be rounded (arrows).

The bearing surfaces must not show any signs of tracking or scoring.

Continue: C22/1 Fig.: C21/2



KMK 01253

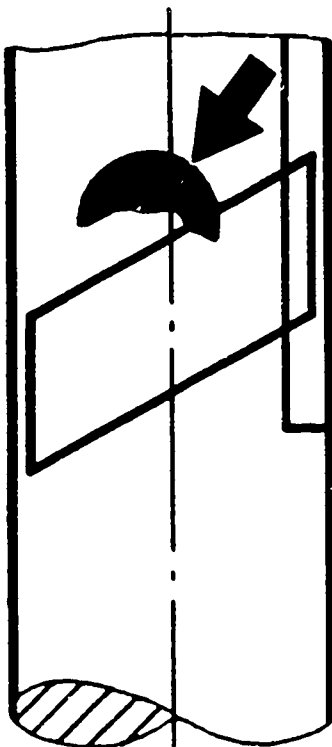
## CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

Pay attention to the following information, so as to avoid uncertainty regarding the assessment of plunger-and-barrel assemblies:

It is appropriate to renew the plunger-and-barrel assemblies in the event of:

- \* Cavitation in the area of the helices (arrow).
- \* Plunger-and-barrel seizure or sticking as a result of dirt or surface coating becoming apparent in slide test (plunger in barrel).

Continue: C23/1 Fig.: C22/2



KMK 01254

CHECKING OF INDIVIDUAL COMPONENTS  
— WEAR ASSESSMENT

Note:

Wash out pump plunger and barrel in calibrating oil before performing slide test.

Hold pump plunger and barrel roughly perpendicular.

Pump plunger must slide downwards in barrel on account of its own weight.

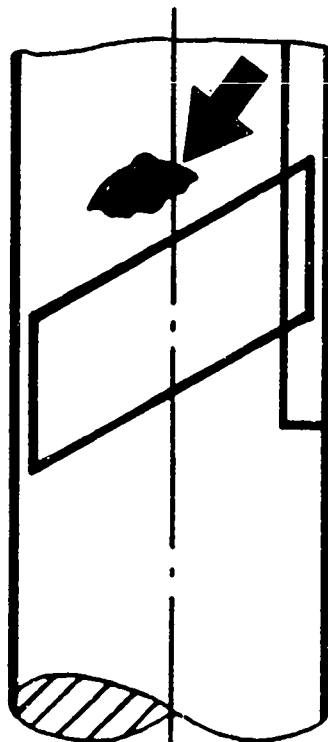
Continue: C24/1

## CHECKING OF INDIVIDUAL COMPONENTS — WEAR ASSESSMENT

Renewal of the plunger-and-barrel assemblies is not appropriate in the event of:

- \* Cavitation above the helices (arrow).
- \* Mat area around the entire periphery.
- \* Bright bearing surfaces (without scoring and mechanical wear).
- \* Discoloration at plunger and flange barrel as a result of fuel and lubricant residues, water in the fuel or the effect of temperature.

Continue: C25/1 Fig.: C24/2



KMK 01255

CHECKING OF INDIVIDUAL COMPONENTS  
- WEAR ASSESSMENT

Note:

There is no seal between pump barrel and delivery valve on series P-8000 pumps.

For this reason, the sealing surface (pump barrel-delivery valve) must be closely examined for damage.

When performing repairs, plunger-and-barrel assemblies and delivery valves can be replaced individually.

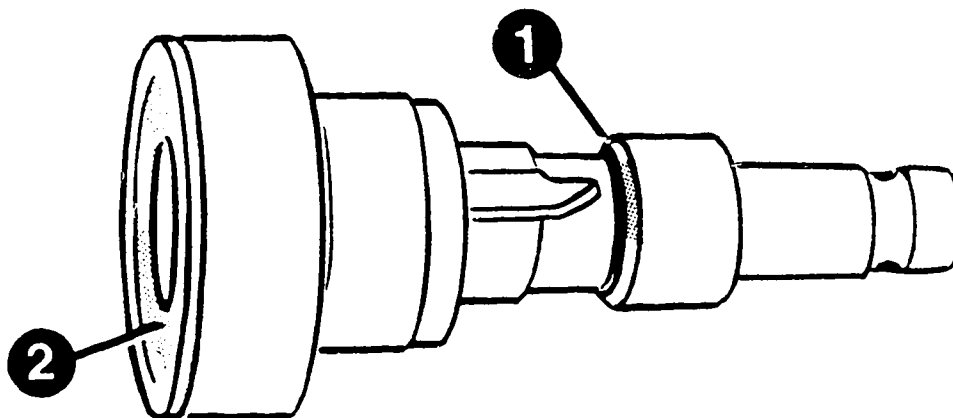
Continue: C26/1

## CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

The seat of the valve taper (1) and the sealing surface of the valve body (2) must not be dented, reveal cavitation or be unevenly worn.

Renew delivery valve if the valve sticks in the valve holder.

Continue: C27/1 Fig.: C26/2



KMK 01256

## CHECKING OF INDIVIDUAL COMPONENTS - WEAR ASSESSMENT

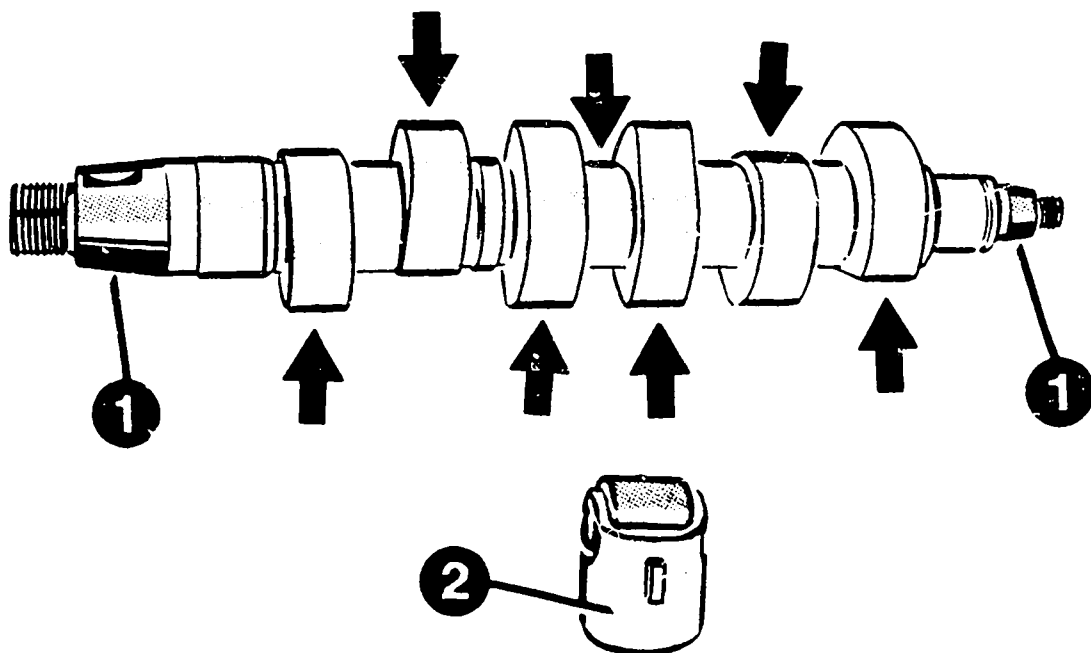
Renew the camshaft if it reveals pronounced running marks (arrows) or if a taper (1) is damaged. If the roller tappet (2) shows corresponding signs of wear, this is likewise to be replaced.

The replacement of roller tappets always results in the renewal of the camshaft.

Intermediate bearings which reveal running marks are to be replaced.

If roller-tappet-shell seizure does not damage the camshaft, then it can be re-used.

Continue: C28/1 Fig.: C27/2

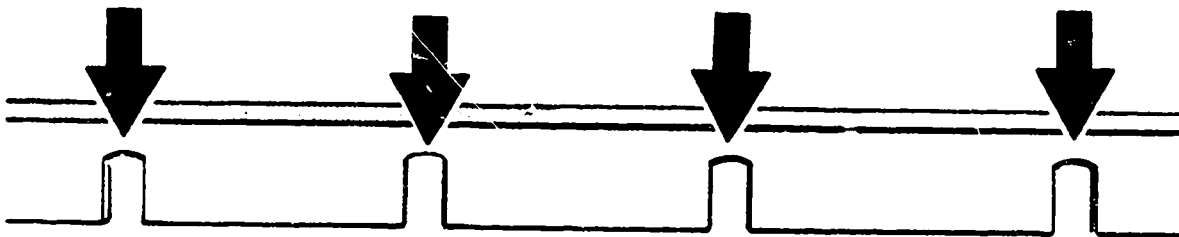


KMK 01257

CHECKING OF INDIVIDUAL COMPONENTS  
- WEAR ASSESSMENT

Examine control rod for worn grooves  
(arrows) and worn control-sleeve  
drive hubs.

Continue: D01/1 Fig.: C28/2



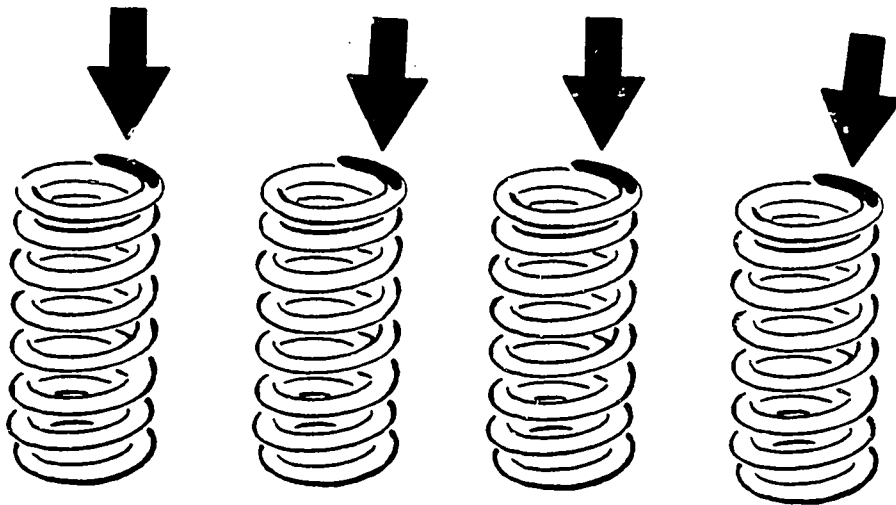
KMK 01258

## CHECKING OF INDIVIDUAL COMPONENTS — WEAR ASSESSMENT

Corroded plunger springs, or plunger springs which exhibit surface damage, must be replaced due to the danger of fracture.

Pay particular attention to the area of the 1st winding seating surface (arrows).

Continue: D02/1 Fig.: D01/2



KMK 01259

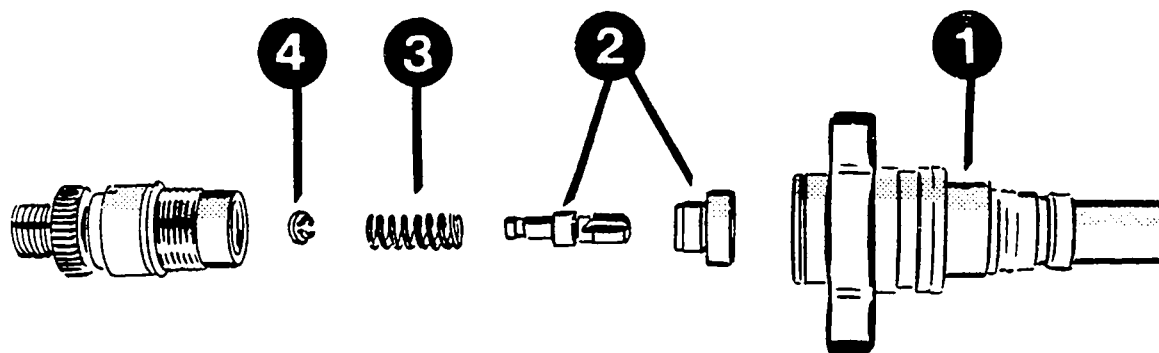
## BARREL-AND-VALVE ASSEMBLY

Position pump barrel (1) in assembly device KDEP 2962. Insert constant-pressure valve (2) and valve spring (3) with spring seat or filler piece (4) into pump barrel.

Important !!!

- \* Lubricant is not to be applied to the underside of the delivery valve and the seating surface of the delivery valve in the pump barrel; moistening with fuel or calibrating oil is permitted.
- \* There is no seal between pump barrel and delivery valve on series P-8000 pumps.

Continue: D03/1 Fig.: D02/2



KMK 01260

## BARREL-AND-VALVE ASSEMBLY

Provide delivery-valve holder with O-ring. Immerse screw-in thread in transmission oil as far as O-ring level and screw in delivery-valve holder by hand.

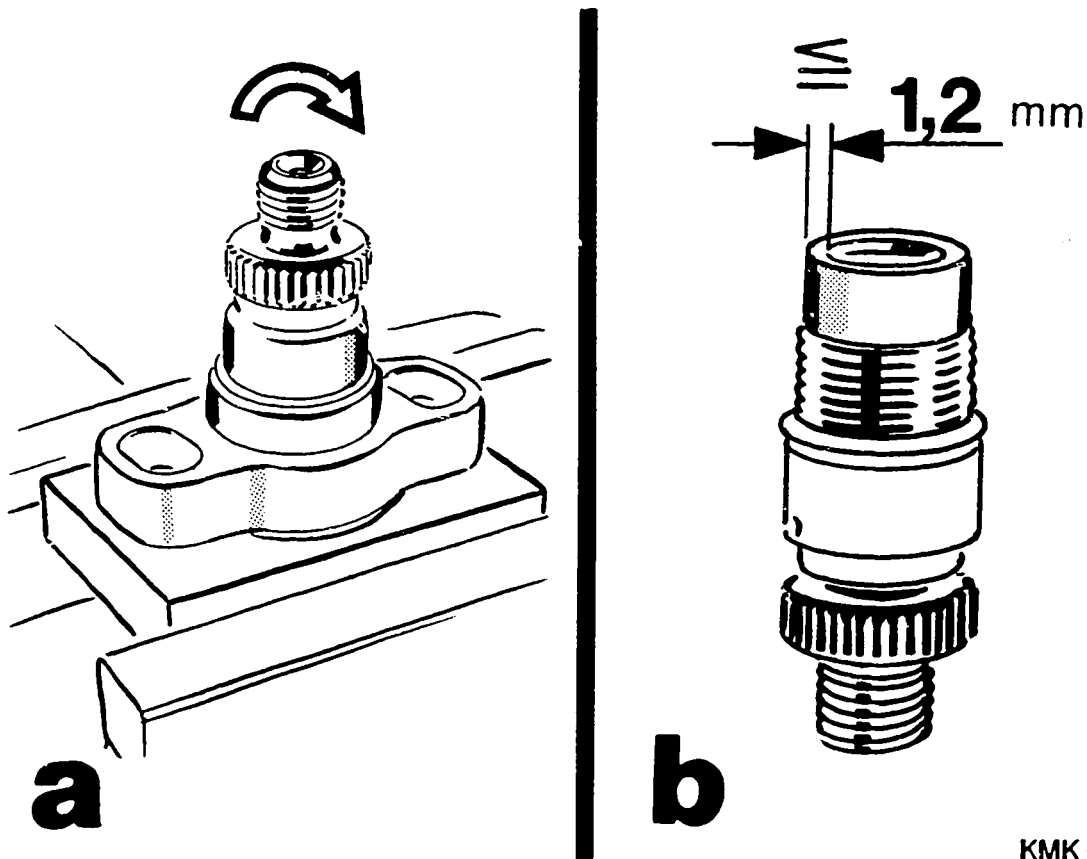
Use socket wrench KDEP 2962 to pre-tighten delivery valve holder to tightening torque of approximately 50 Nm.

Then carry out final tightening of delivery-valve holder in one operation to 110...120 Nm (Fig. a).

### Note:

Flattened gripping edges of delivery-valve holders which have already been used must be  $\leq 1.2$  mm (Fig. b).

Continue: D04/1 Fig.: D03/3

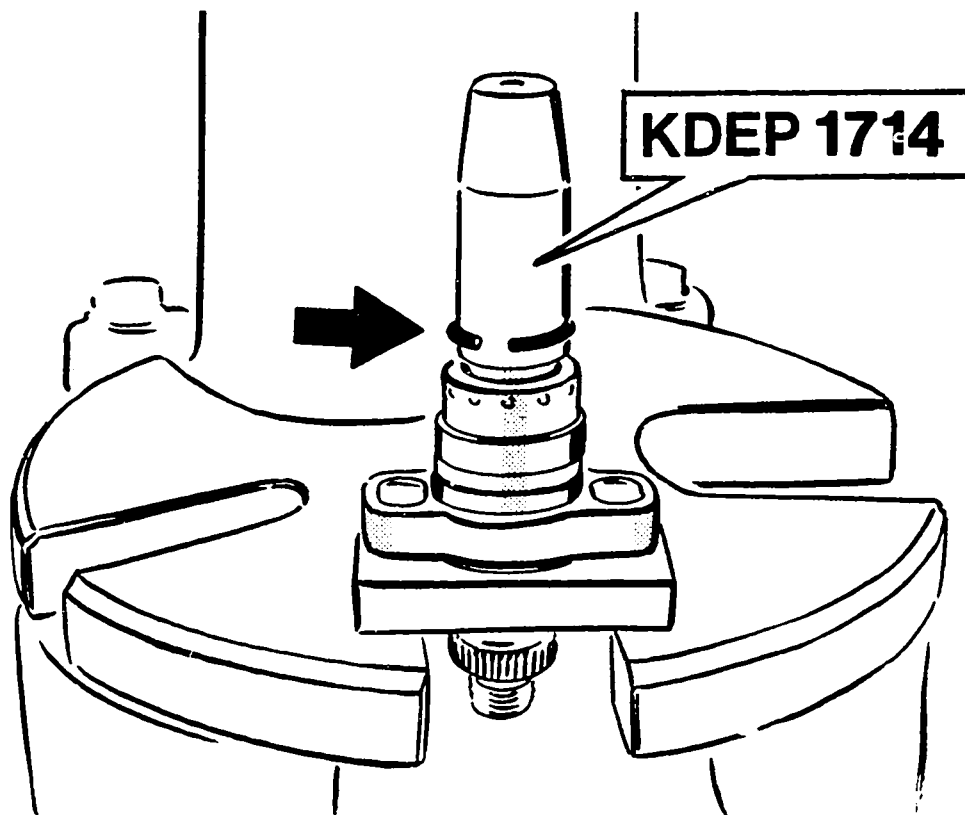


KMK 01261

## BARREL-AND-VALVE ASSEMBLY

Turn pump barrel around and position it again in assembly device KDEP 2962. Attach impact cap to barrel. Push retaining ring of impact cap over inner section of assembly device KDEP 1714. Attach inner section of assembly device KDEP 1714 to pump barrel.

Continue: D05/1 Fig.: D04/2

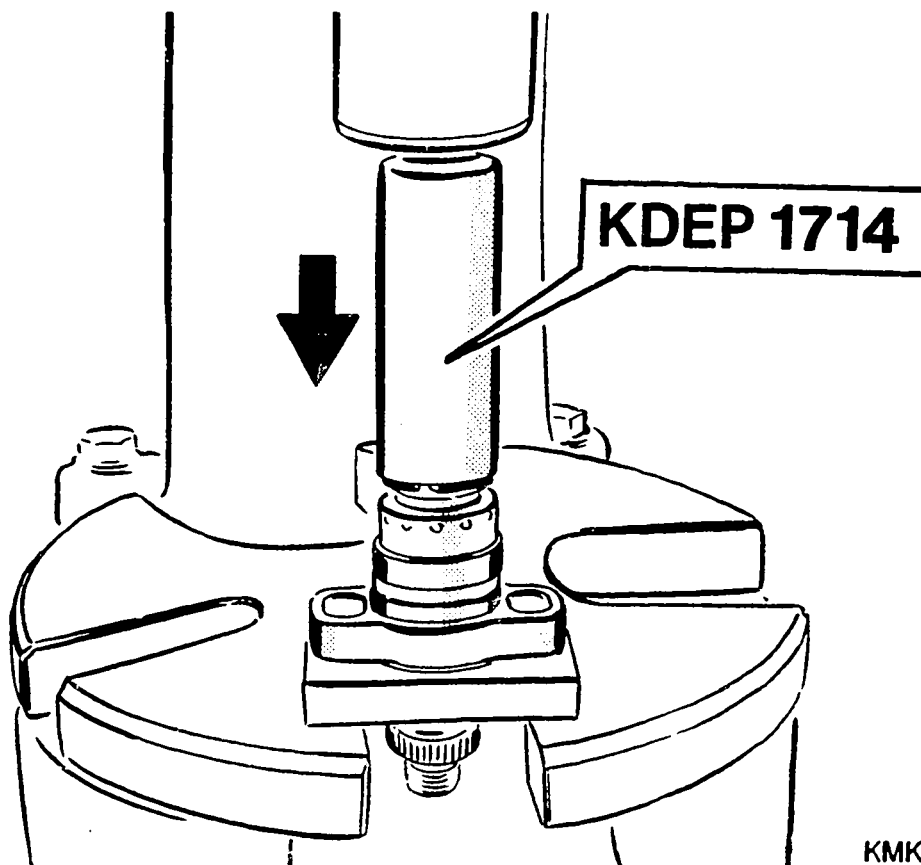


KMK 01262

## BARREL-AND-VALVE ASSEMBLY

The outer section of the assembly device KDEP 1714 is then used under a press to push the ring onto the pump barrel (picture).

Continue: D06/1 Fig.: D05/2



KMK 01263

## BARREL-AND-VALVE ASSEMBLY

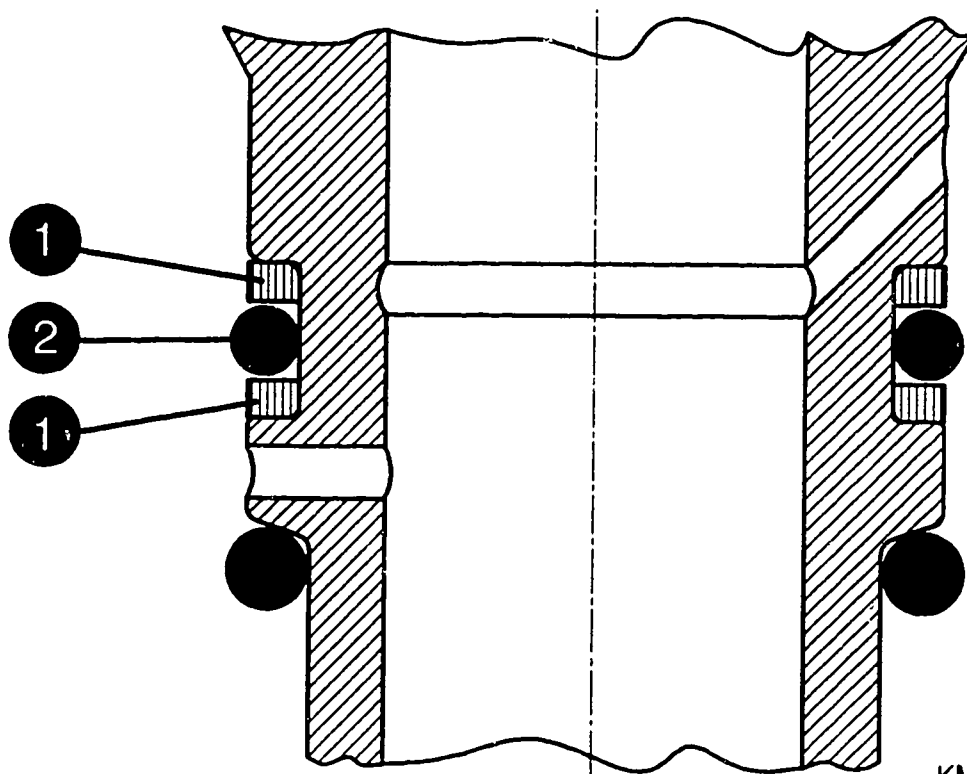
Push missing O-rings onto barrel-and-valve assembly.

If support rings (1) are provided, these must be installed at the smaller O-ring (2) as shown in the picture. The support rings are open on one side and thus are easy to position around the assembly.

### Note:

If barrel-and-valve assemblies have not been provided with the support rings at the factory, then these are not to be retrofitted.

Continue: D07/2 Fig.: D06/2



KMK01264

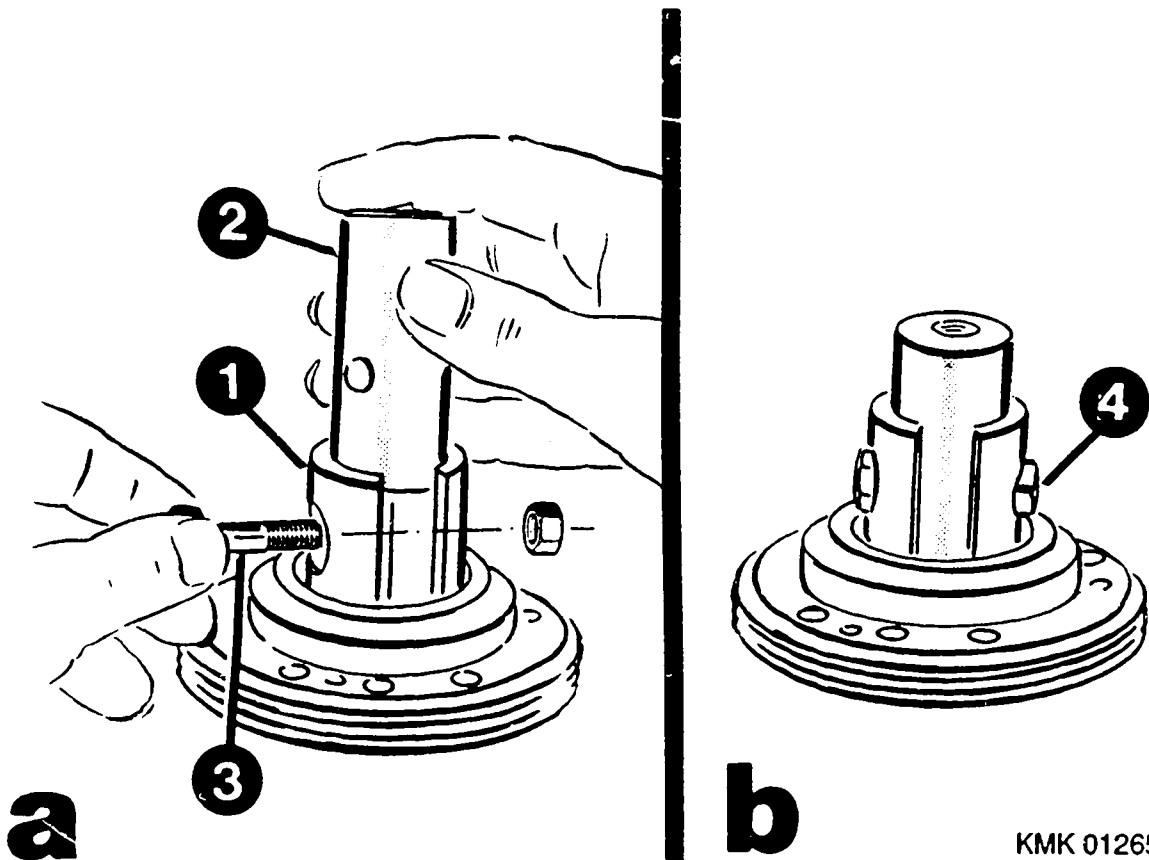
## REPLACING CAMSHAFT BEARING - BEARING END PLATE

Remove cylindrical rollers of drive-end bearing and insert both halves of puller KDEP 1570 (1) into bearing outer race.

The holding mandrel (2) is then to be inserted between the puller parts such that the connecting screw (3) can be pushed through all three parts (picture a).

Then screw the fastening nut (4) onto the connecting screw and tighten by hand (picture b).

Continue: D08/1 Fig.: D07/2



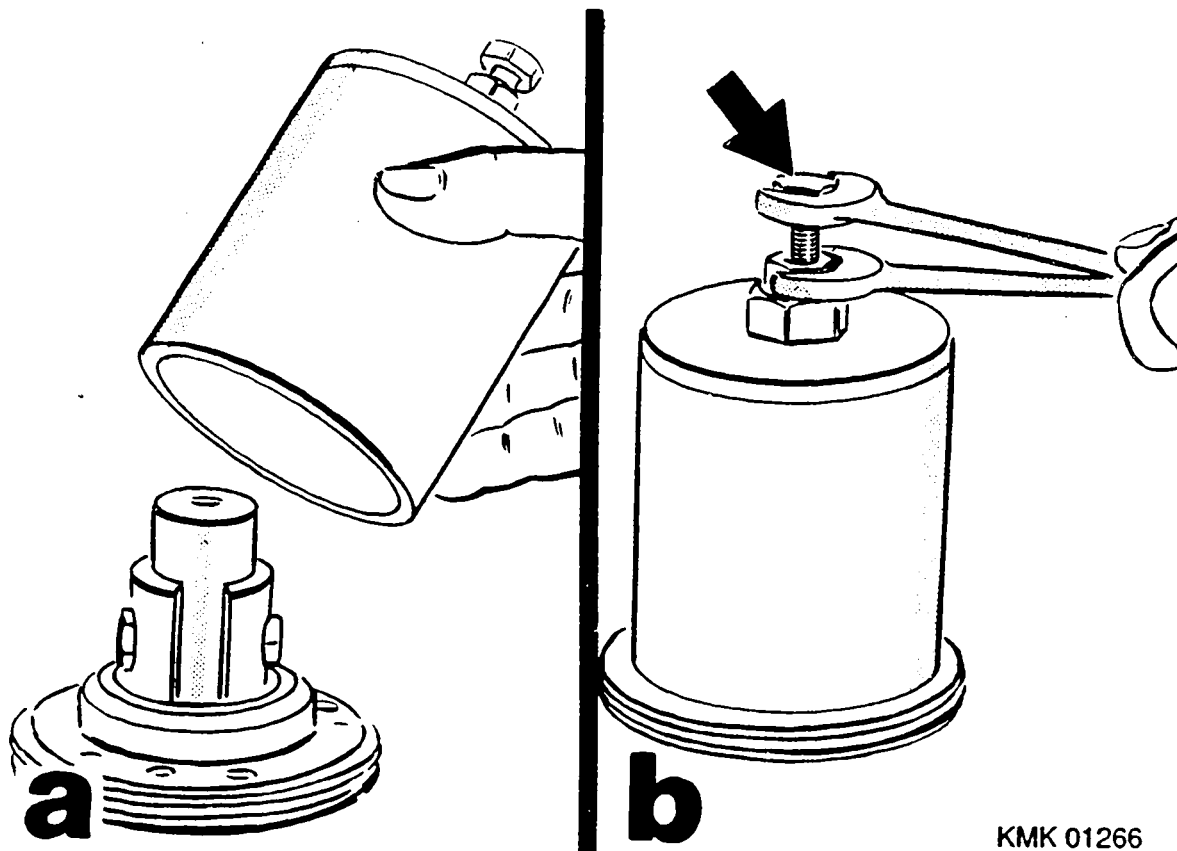
KMK 01265

## REPLACING CAMSHAFT BEARING — BEARING END PLATE

Position puller bell KDEP 1569/1 over fitted puller (picture a).  
Screw pressing-off screw into nut of puller (arrow) and pull bearing outer race out of bearing end plate with puller KDEP 1570 by turning nut with wrench. In doing so, counter-hold screw (picture b).

This process destroys the bearing outer race. The complete bearing is to be scrapped and replaced with a new one.

Continue: D09/1 Fig.: D08/2



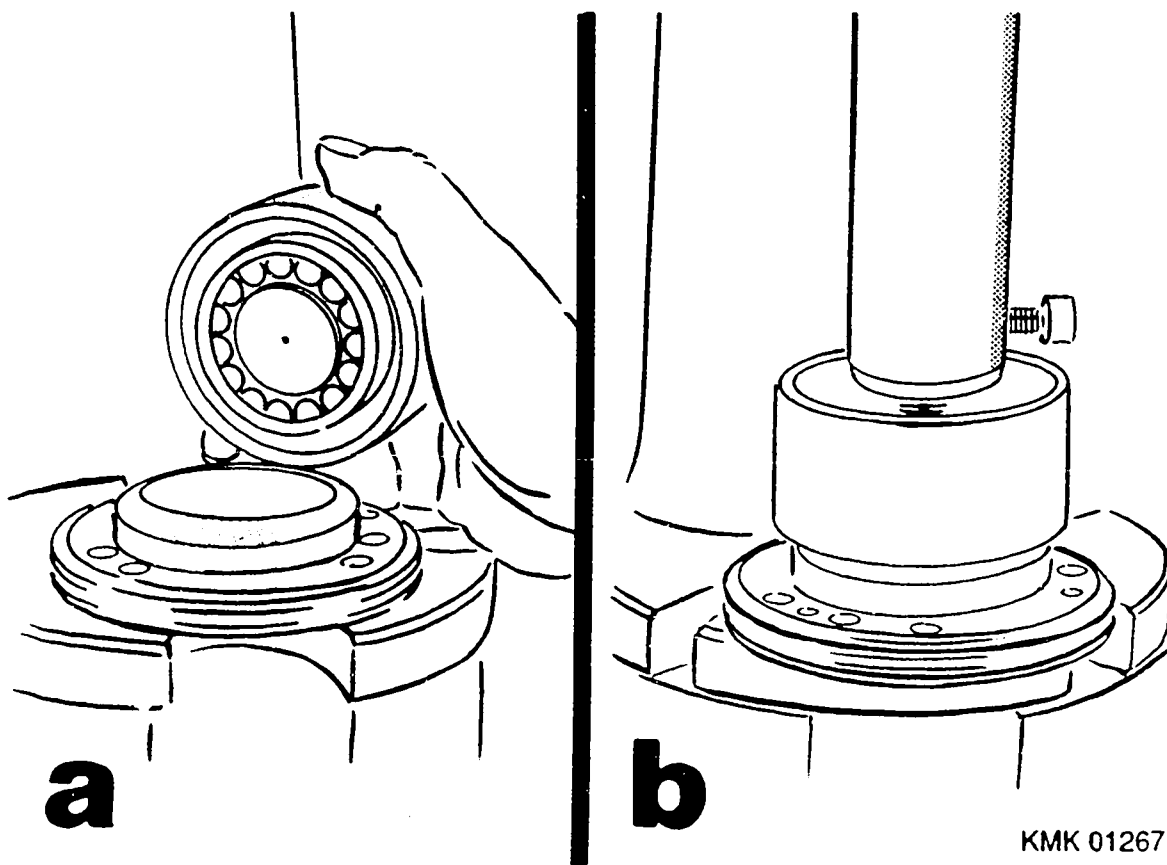
KMK 01266

## REPLACING CAMSHAFT BEARING - BEARING END PLATE

Attach cylindrical-roller bearing for installation in drive-end bearing end plate to mandrel of pressing-in tool KDEP 1551 (picture a).

Press cylindrical-roller bearing into corresponding hole in bearing end plate as far as it will go (picture b).

Continue: D10/1 Fig.: D09/2



KMK 01267

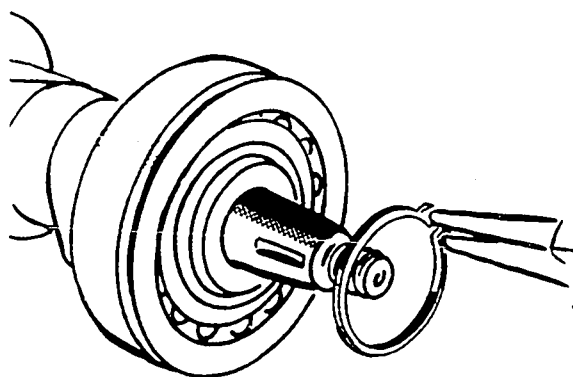
# REPLACING CAMSHAFT BEARING — SELF-ALIGNING ROLLER BEARING

Remove retaining ring from camshaft  
(picture a).

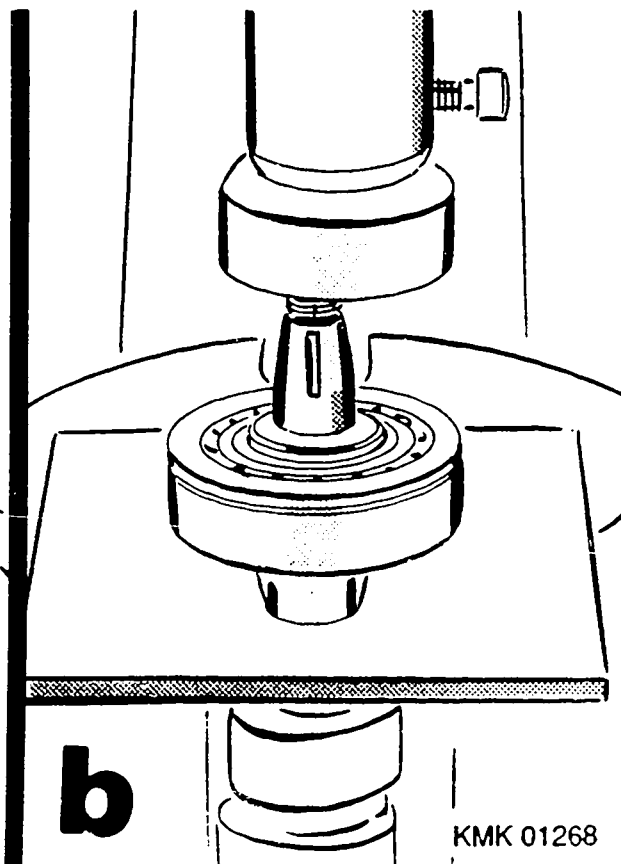
Use pressing-off plate KDEP 1580 to  
press camshaft out of self-aligning  
bearing (picture b).

This destroys the bearing.  
Re-use is not permitted.

Continue: D11/1 Fig.: D10/2



**a**



**b**

KMK 01268

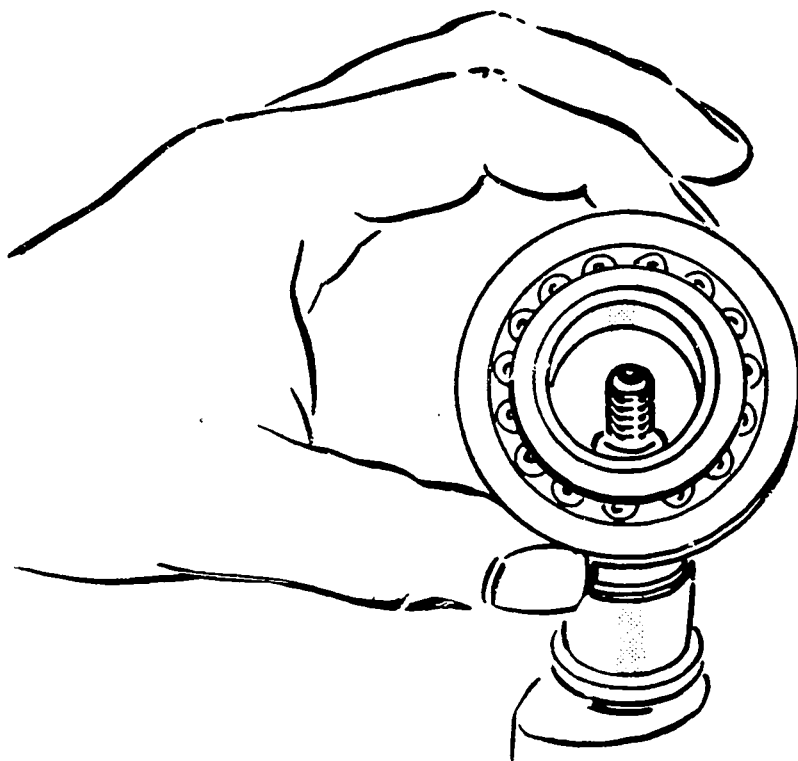
## REPLACING CAMSHAFT BEARING - SELF-ALIGNING ROLLER BEARING

The governor-end camshaft bearing is a self-aligning roller bearing.

For this reason, extreme caution is to be employed during subsequent mounting of this bearing on the camshaft.

Position camshaft such that it is perpendicular and provisionally attach complete self-aligning roller bearing to camshaft.

Continue: D12/1 Fig.: D11/2



KMK 01269

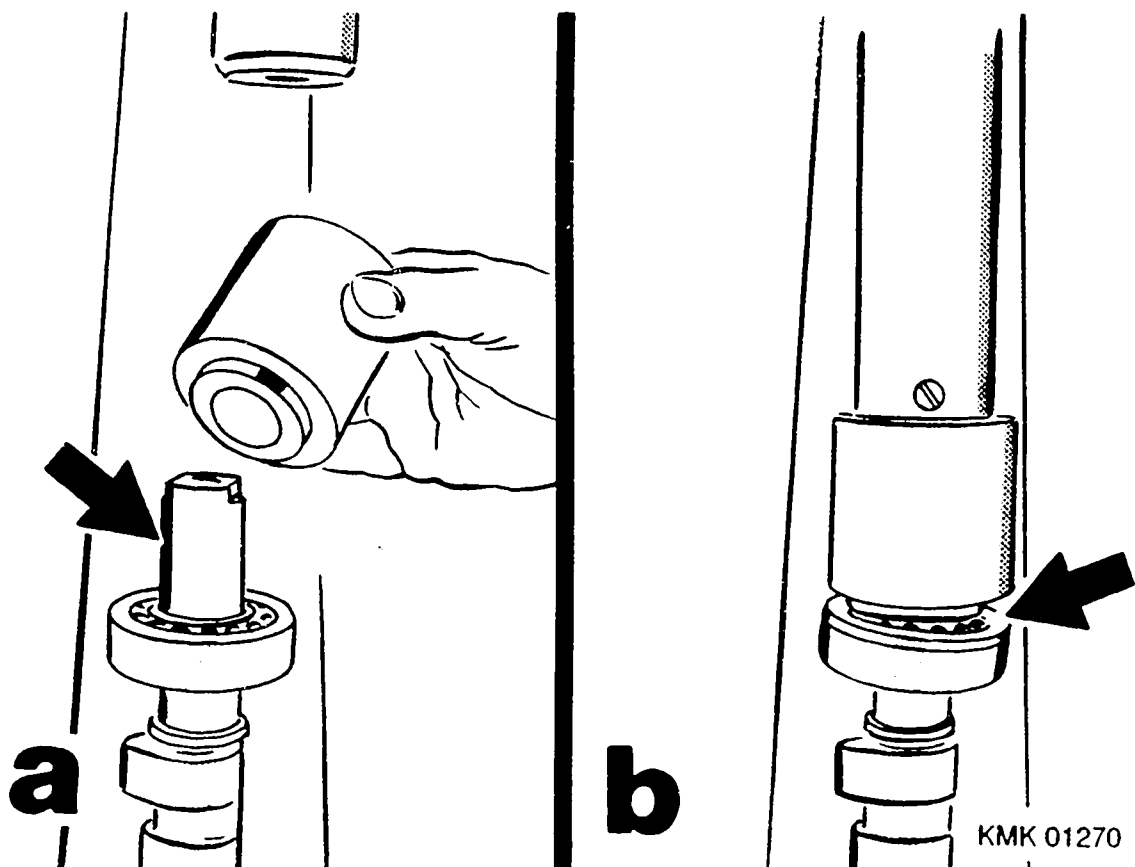
**REPLACING CAMSHAFT BEARING  
- SELF-ALIGNING ROLLER BEARING**

Screw guide nut of pressing-in tool KDEP 1552 (picture a - arrow) onto thread of camshaft.

Carefully position sleeve of tool with machined collar on inner race of self-aligning roller bearing (picture b - arrow) and press bearing onto camshaft bearing seat as far as it will go.

When installing the bearing, care is to be taken to ensure that the annular groove in the bearing outer race is on the outside.

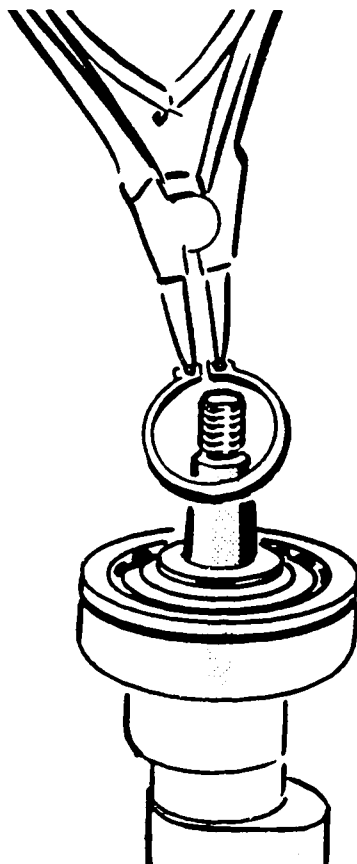
Continue: D13/1 Fig.: D12/1



REPLACING CAMSHAFT BEARING  
- SELF-ALIGNING ROLLER BEARING

Fit shaft retaining ring.

Continue: D14/1 Fig.: D13/2

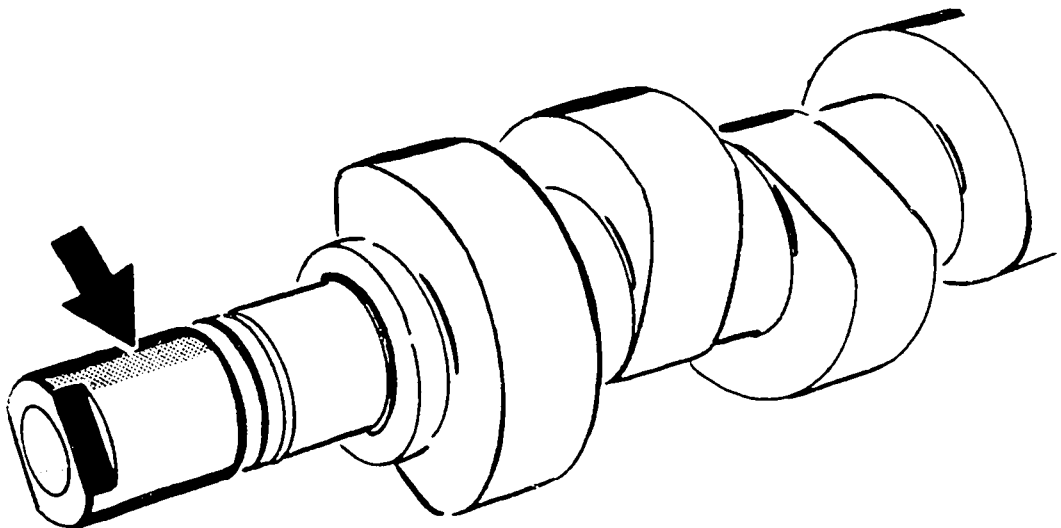


KMK 01271

REPLACING CAMSHAFT BEARING  
- CYLINDRICAL-ROLLER BEARING

Screw guide nut of KDEP 1069 (arrow)  
onto camshaft.

Continue: D15/1 Fig.: D14/2



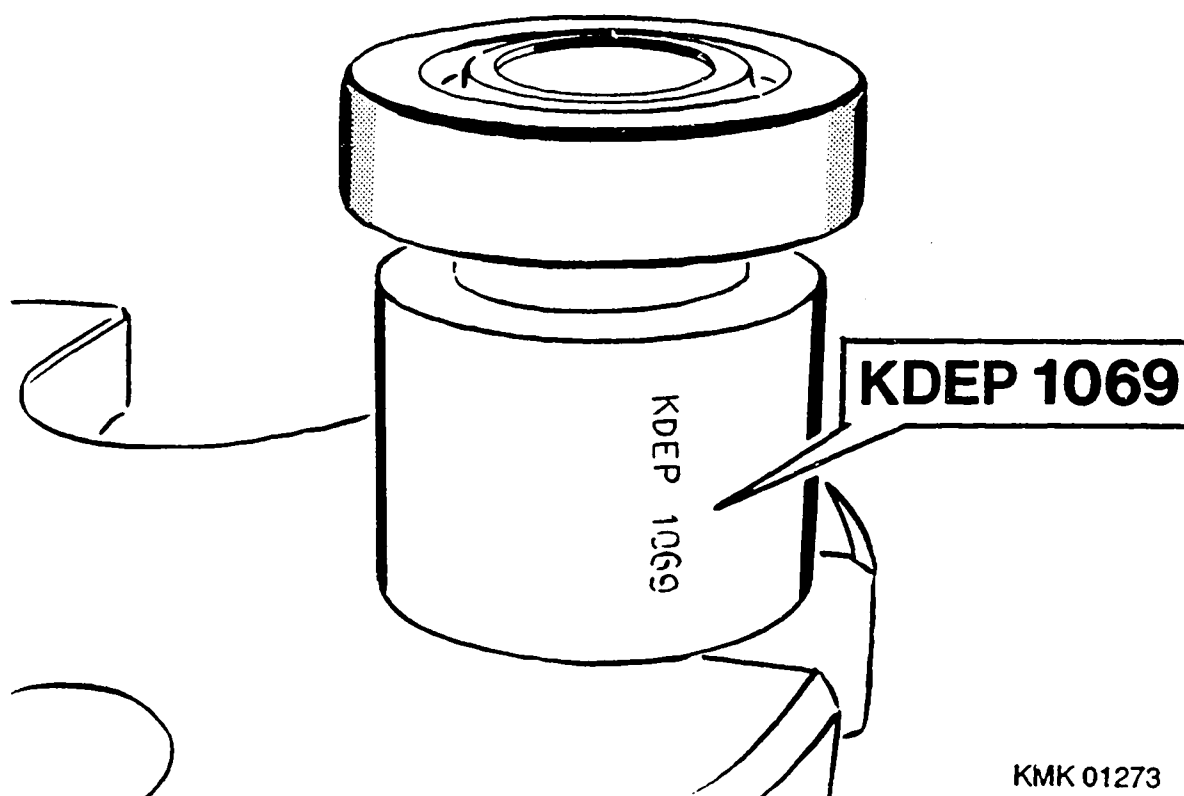
KMK 01272

**REPLACING CAMSHAFT BEARING  
- CYLINDRICAL-ROLLER BEARING**

Position basic body of KDEP 1069 on  
press with shoulder facing upwards.

Place cylindrical-roller bearing on  
top of it with closed side upwards.

Continue: D16/1 Fig.: D15/2



KMK 01273

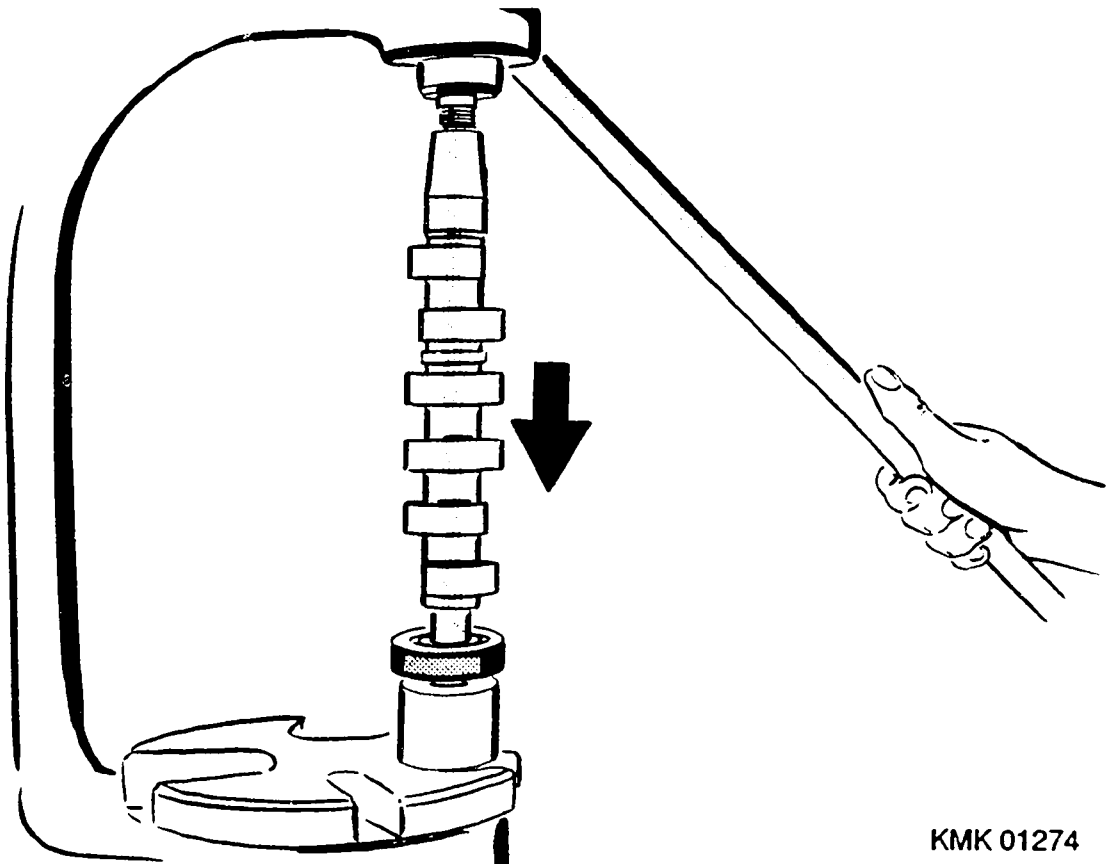
REPLACING CAMSHAFT BEARING  
- CYLINDRICAL-ROLLER BEARING

Insert camshaft with the screwed-on guide nut through bearing inner race and basic body of KDEP 1069.

Press inner race onto camshaft as far as collar by uniformly pressing stem (n o h a m m e r i n g !).

Unscrew guide nut from KDEP 1069.

Continue: D17/1 Fig.: D16/2



KMK 01274

## ASSEMBLY OF FUEL-INJECTION PUMP

Moisten pump plunger with calibrating oil prior to assembly.

Rub over O-rings with tallow.

Continue: D18/1

## FITTING BARREL-AND-FLANGE ELEMENTS

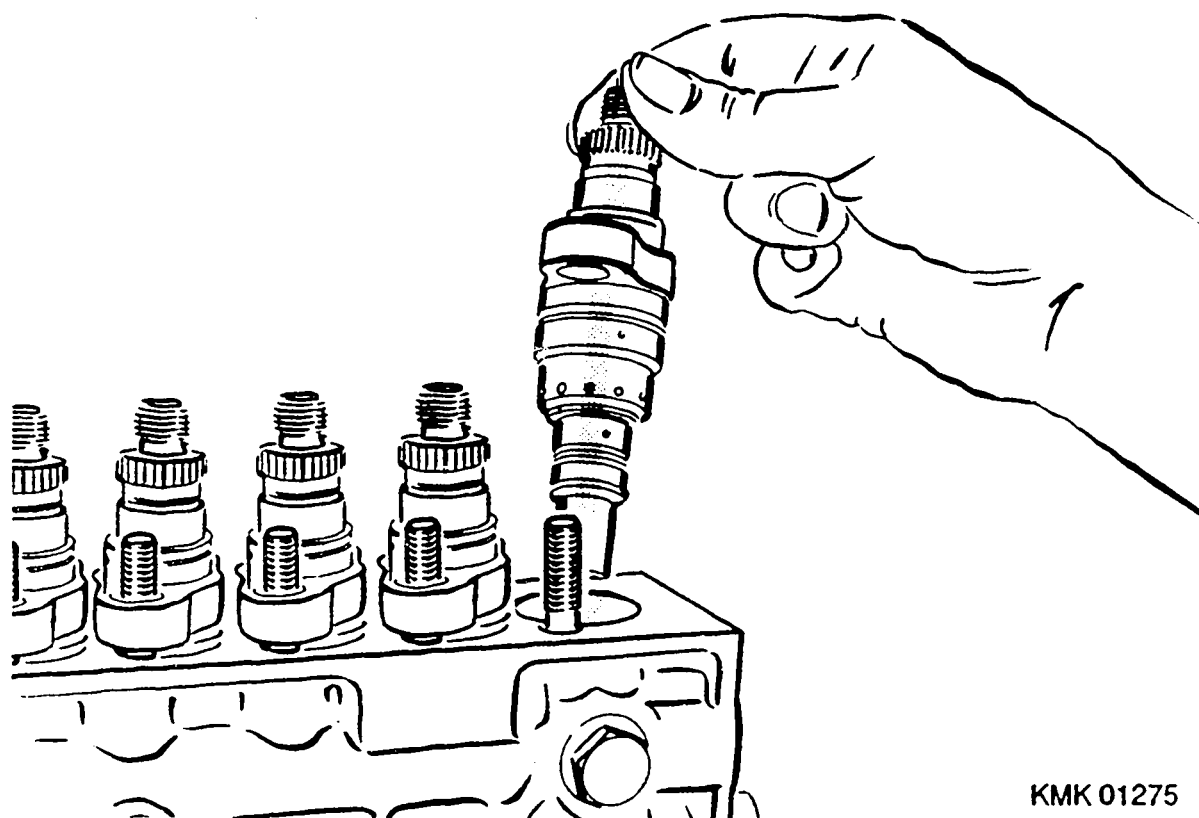
Insert barrel-and-flange element such that notch faces toward control rod (back of pump).

Do not force in barrel-and-valve assembly !!!

Screw on hexagon nut, but do not tighten it.

Turn barrel-and-valve assemblies such that stay bolts are in center of slots.

Continue: D19/1 Fig.: D18/2



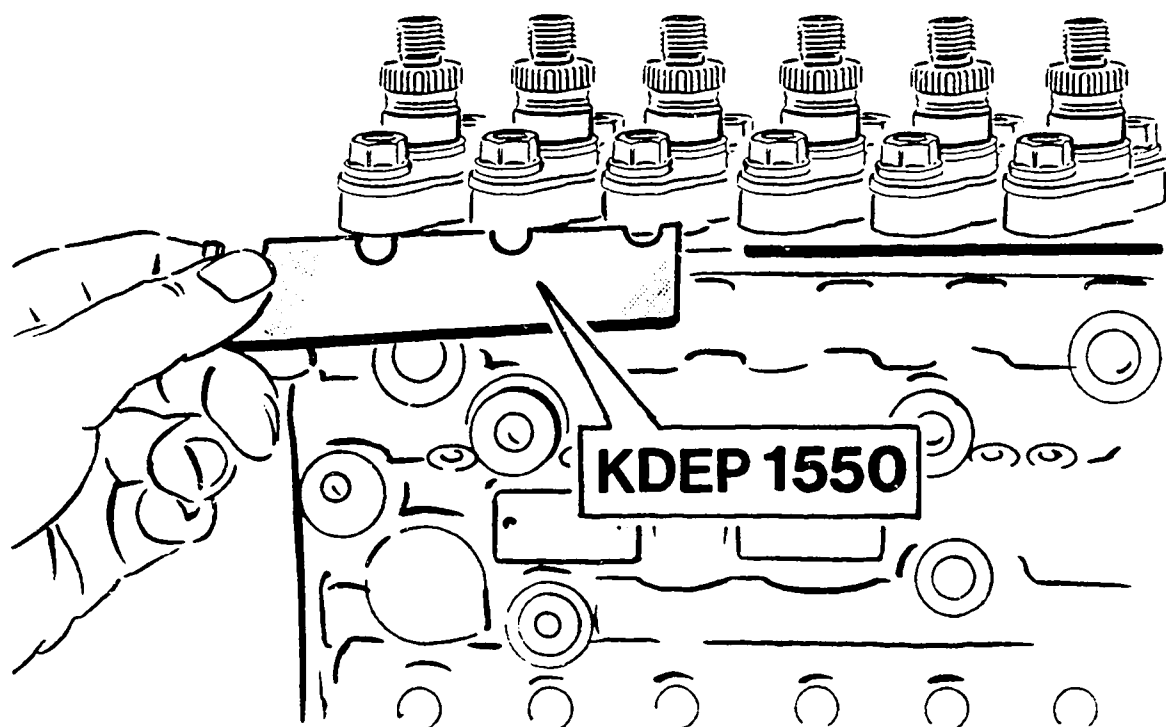
KMK 01275

## FITTING BARREL-AND-FLANGE ELEMENTS

Raise barrel-and-flange elements such that spacers KDEP 1550 can be inserted beneath them.

Tighten fastening nut by hand to such an extent that spacers cannot drop out beneath assembly flanges.

Continue: D20/1 Fig.: D19/2



KMK 01276

## SUCTION-GALLERY LEAK TEST

Tilt pump, moisten pump with calibrating oil and insert into barrel-and-valve assemblies. Pay attention to freedom of movement.

Insert retaining pin KDEP 1571 into setting hole.

Unscrew pump from clamping support.

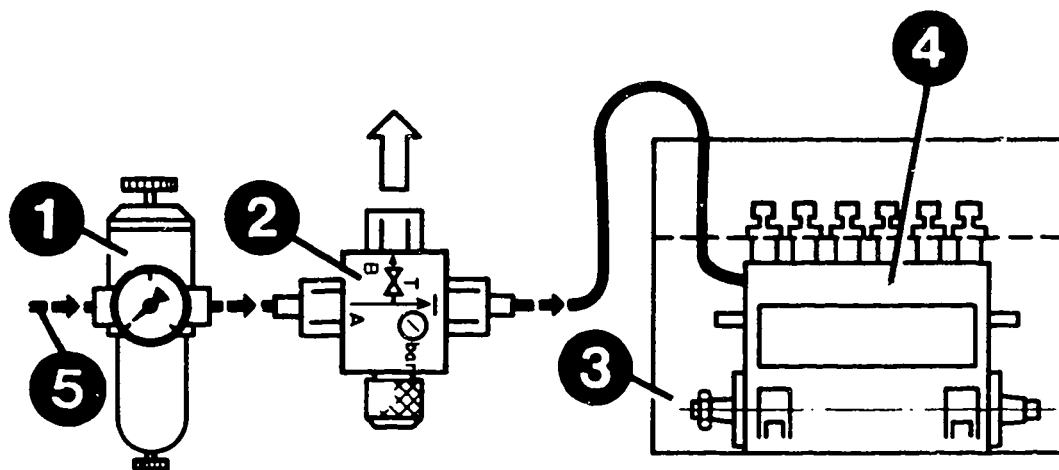
Connect up pump by way of pressure-reducing valve with water trap to compressed-air network.

Continue: D21/1

## SUCTION-GALLERY LEAK TEST

- 1 = Pressure-reducing valve with pressure gauge 0 ... 6 bar and water trap
- 2 = Directional-control valve KDJE-P 100/1
- 3 = Immersion bath with calibrating oil
- 4 = Fuel-injection pump
- 5 = Direction of flow of compressed air

Continue: D22/1 Fig.: D21/2



KMK 01277

## SUCTION-GALLERY LEAK TEST

In order to achieve prescribed drop in pressure during leak test, insert directional-control valve KDJE-P 100/1 of pressure measuring device KDJE-P 100 into compressed-air inlet.

Immerse pump perpendicularly into test bath for test purposes.

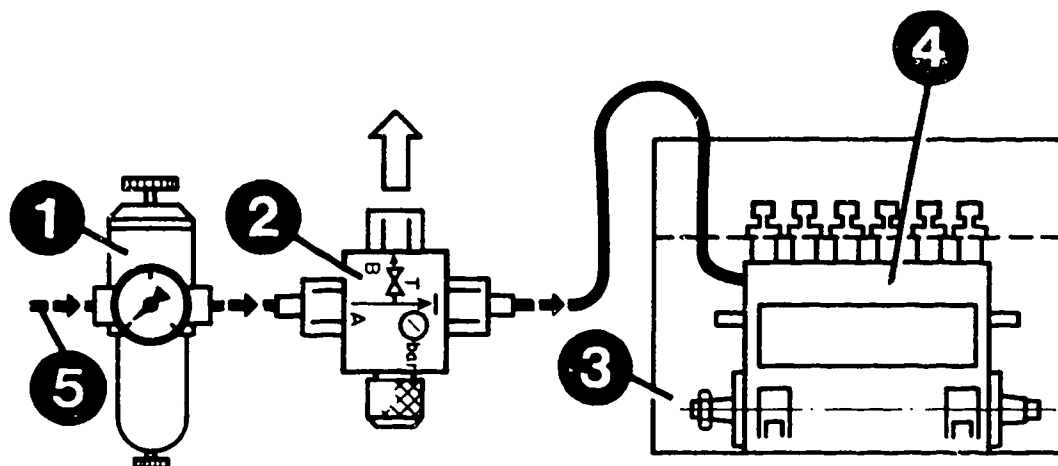
The openings in the delivery-valve holders must not be flooded with calibrating oil.

Continue: D23/1

## SUCTION-GALLERY LEAK TEST

- 1 = Pressure-reducing valve with pressure gauge 0 ... 6 bar and water trap
- 2 = Directional-control valve KDJE-P 100/1
- 3 = Immersion bath with calibrating oil
- 4 = Fuel-injection pump
- 5 = Direction of flow of compressed air

Continue: D24/1 Fig.: D23/2



KMK 01277

## SUCTION-GALLERY LEAK TEST

Swivel pump only to localize a possible leak.

Test duration and test pressure:  
8 minutes at 5 bar  
then 1 minute pulsating 0 ... 5 bar

Leakages in the area of the suction gallery are not permitted.  
Pay particular attention to freedom from leaks of assembly seats.

Leaks between assembly cylinder and plunger are an exception.

Continue: D24/2

## SUCTION-GALLERY LEAK TEST

Remove pump from test bath and attach to clamping support.

Remove retaining pins.

Pull pump plunger out of barrel-and-valve assembly.

### Note:

To avoid possible skin irritation, apply protective cream to hands before commencing test and wash hands in soap and water upon completion of testing. Use rubber gloves where possible.

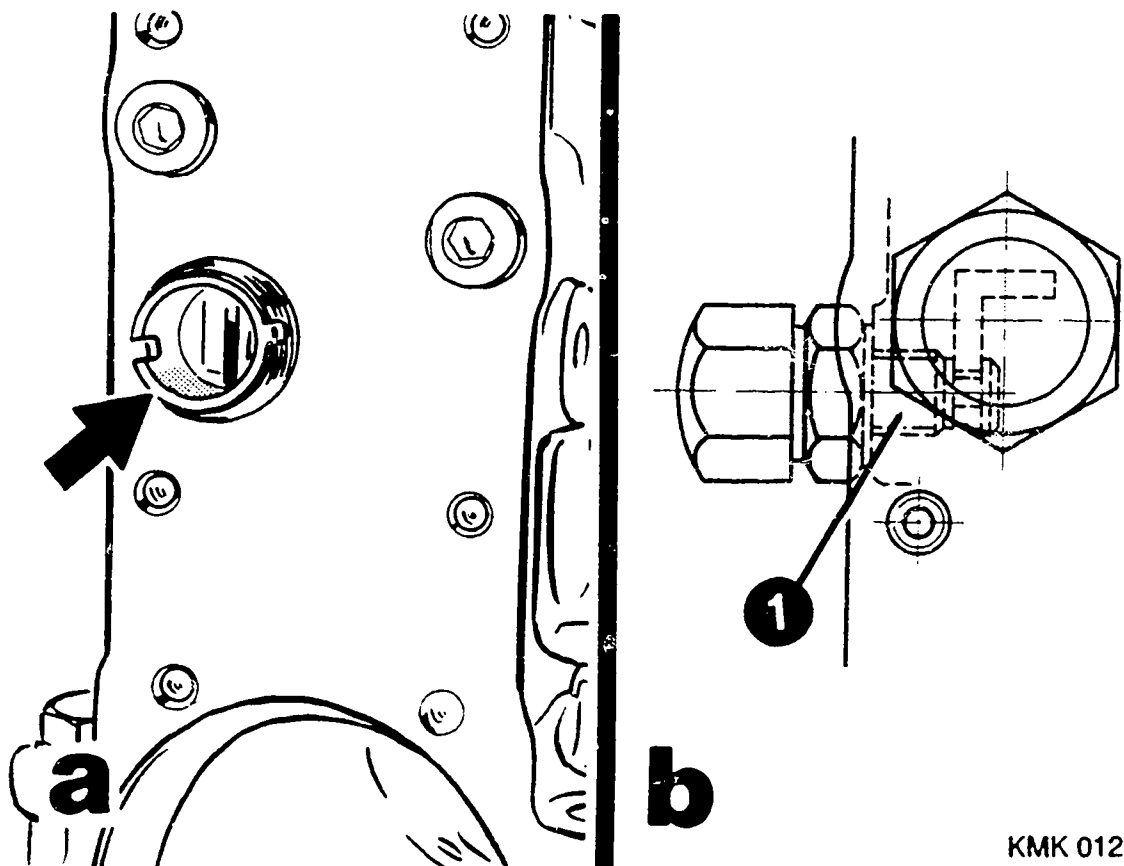
Continue: D25/1

## INSTALLING CONTROL ROD (RE-POSITIONER)

Screw in threaded ring (picture a - arrow) with pin-type socket wrench KDEP 1577 and tighten to 30 ... 40 Nm.

Screw control-rod guide screw into pump housing (picture b - item 1).

Continue: D26/1 Fig.: D25/2



KMK 01278

## INSTALLING CONTROL ROD (RE-POSITIONER)

Insert control rod on governor end and tighten control-rod nut (2) to 30 ... 40 Nm.

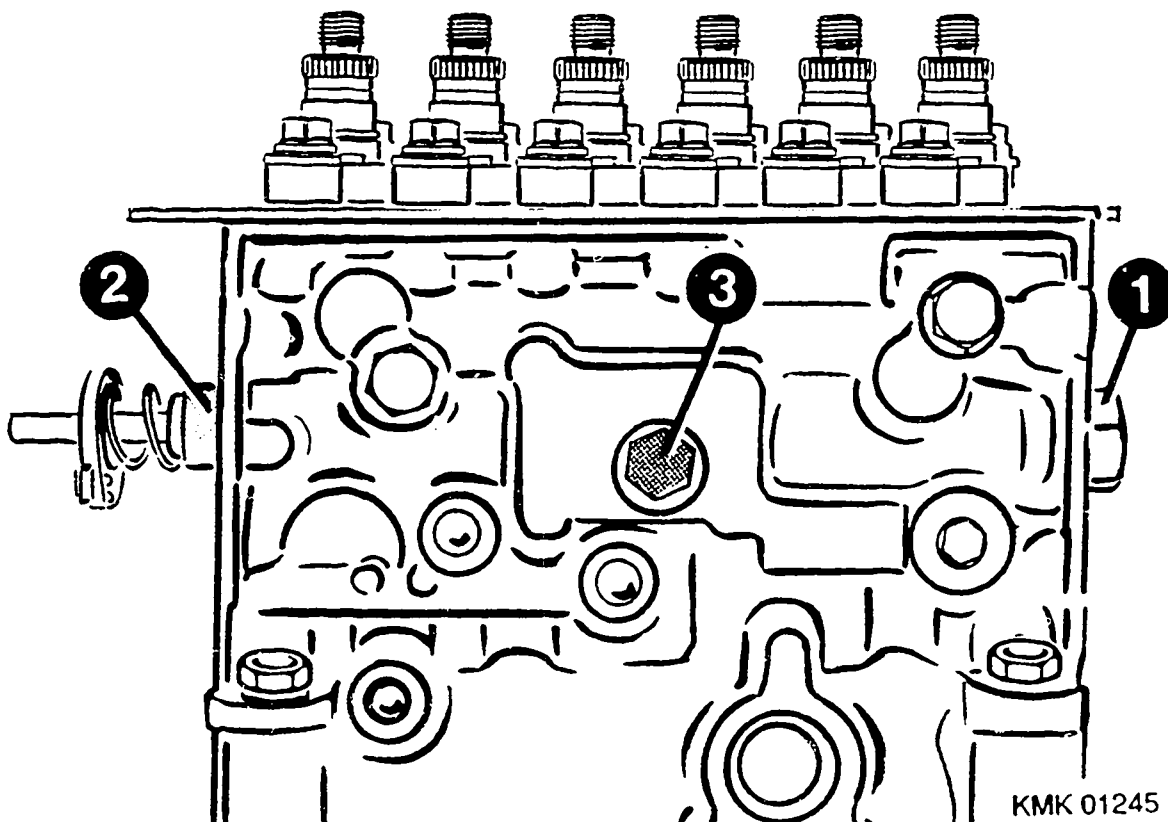
Screw in plug with sealing ring (1) and tighten to 30 ... 40 Nm.

Check whether control rod moves freely.

### Note:

Before checking whether control rod moves freely, control-rod return spring must be pretensioned with spring tensioner KDEP 1704 and thus rendered ineffective.

Continue: D27/1 Fig.: D26/2



## INSTALLING CONTROL ROD (MECHANICAL GOVERNOR)

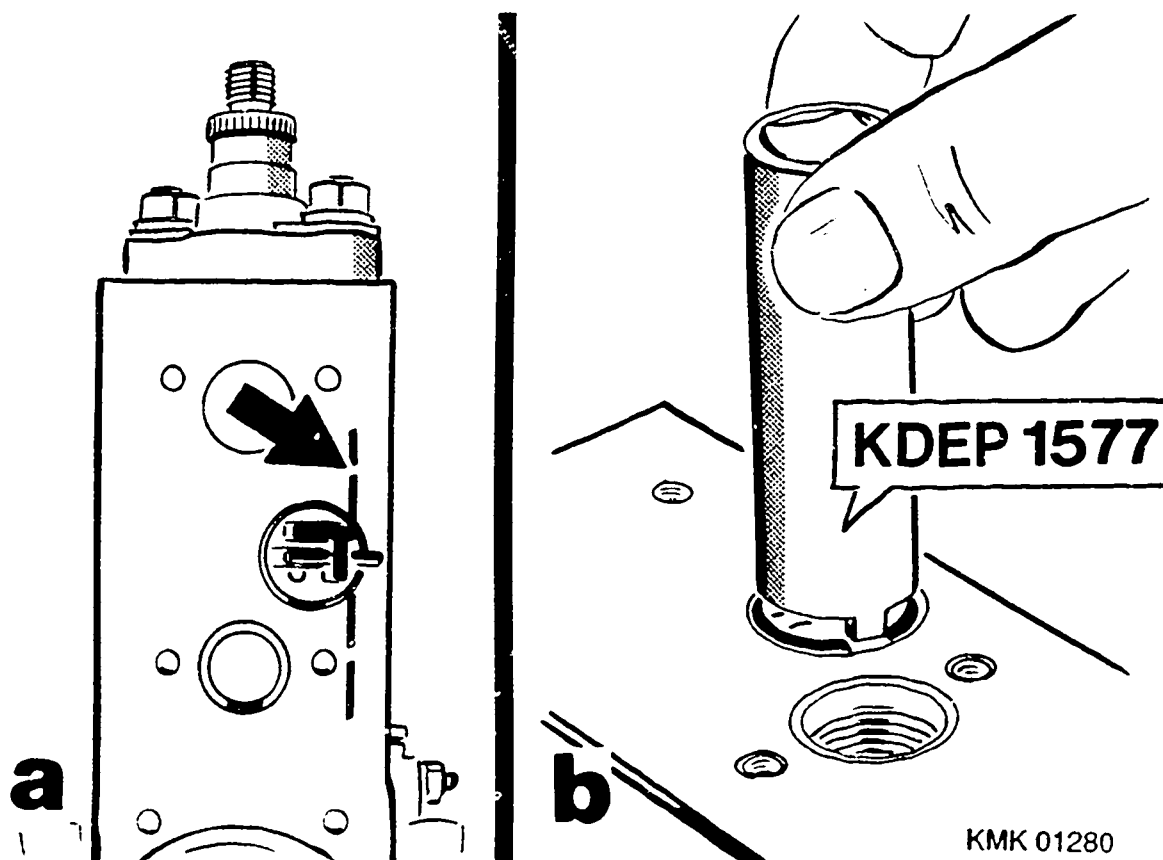
Press new guide bushing (where necessary) with suitable sleeve onto governor end in such a manner that the perpendicular guide groove in the guide bushing is in parallel with the pump housing (picture a).

Insert control rod.

Insert straight pin into guide bushing.

Screw in threaded ring with pin-type socket wrench KDEP 1577 and tighten to 30 ... 40 Nm (picture b).

Continue: D28/1 Fig.: D27/2



KMK 01280

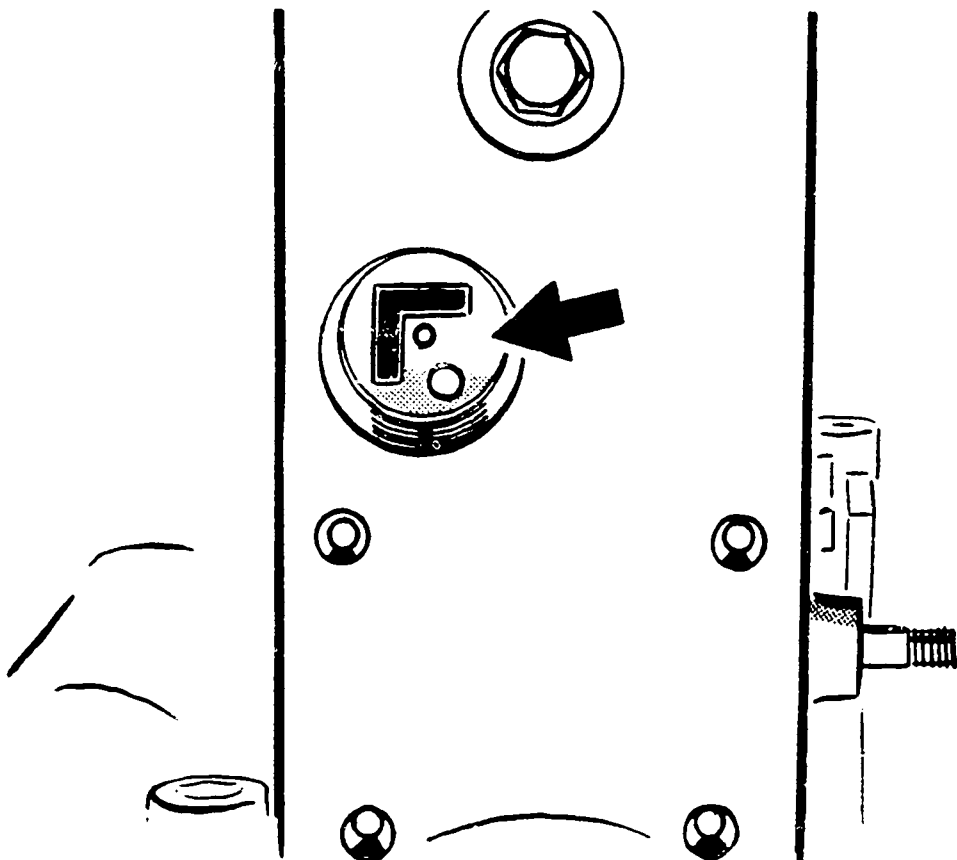
## INSTALLING CONTROL ROD (MECHANICAL GOVERNOR)

Insert guide bushing (arrow) over guide rod into housing on drive end (guide bushing does not have interference fit).

Screw in plug with sealing ring and tighten to 30 ... 40 Nm.

Check whether control rod moves freely.

Continue: E01/1 Fig.: D28/2



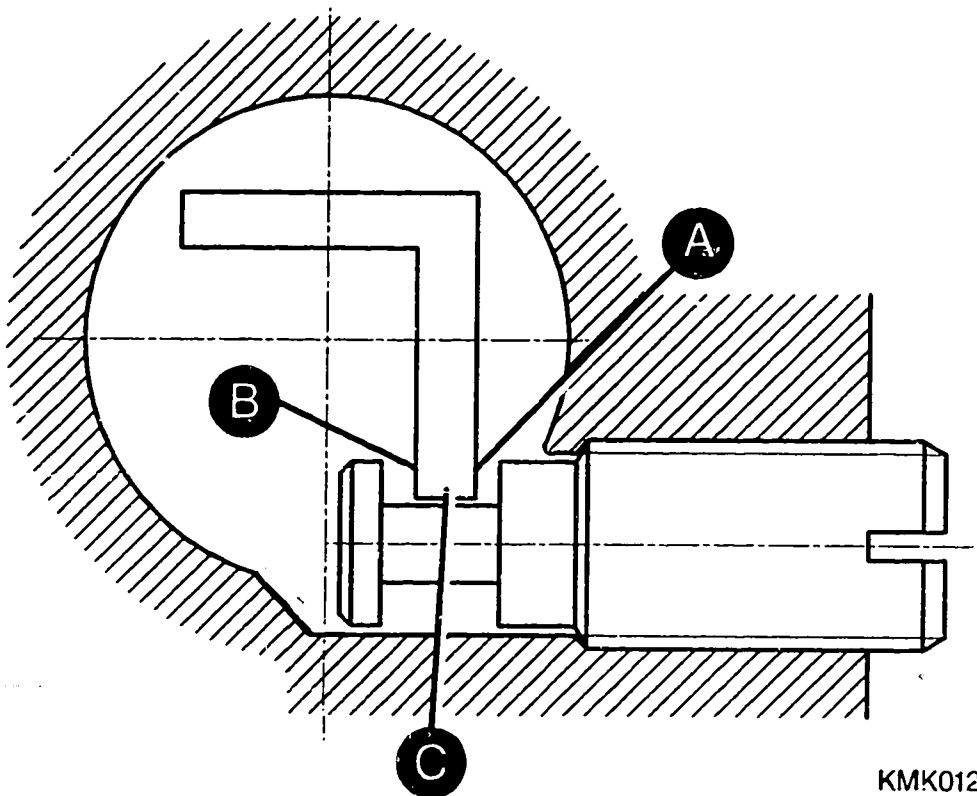
KMK 01281

## INSTALLING CONTROL ROD

Screw in the guide screw by hand until control rod is contacted at point A.  
Screw out guide screw as far as contact point B.  
Screw guide screw back in again by half the distance screwed back (point C).

Tighten lock nut and cap of control-rod guide screw.

Continue: E02/1 Fig.: E01/2



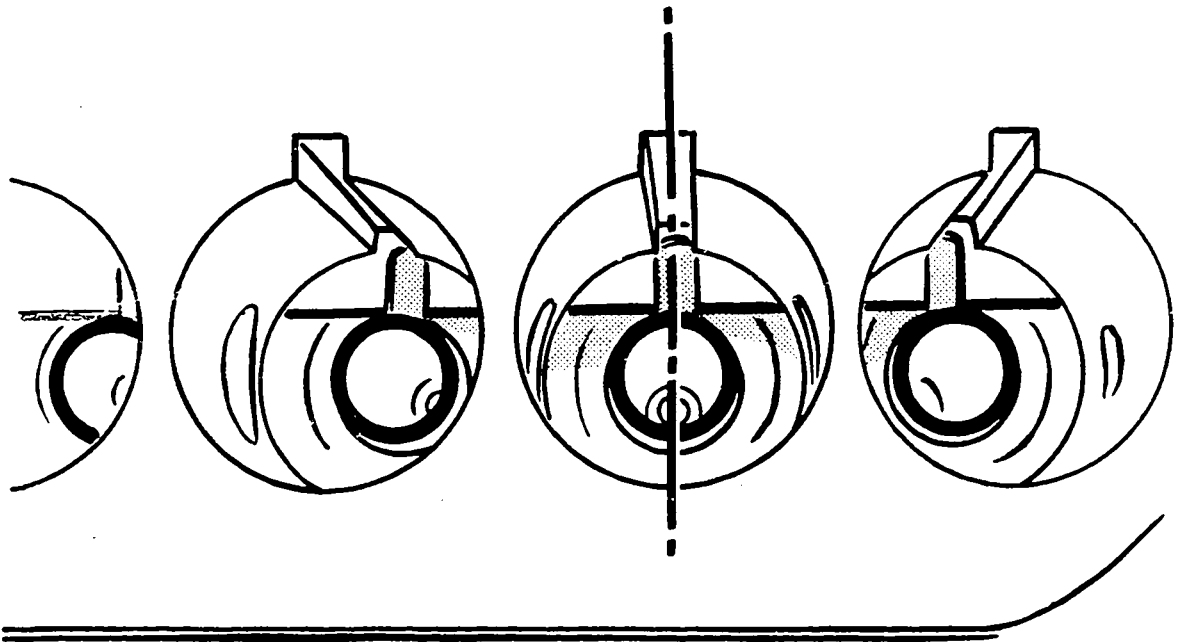
KMK01282

## INSERTING CONTROL SLEEVES

Move control rod to center position.

Drive-hub slots in control rod for control sleeve coincide with roller-tappet guides in pump housing.

Continue: E03/1 Fig.: E02/2



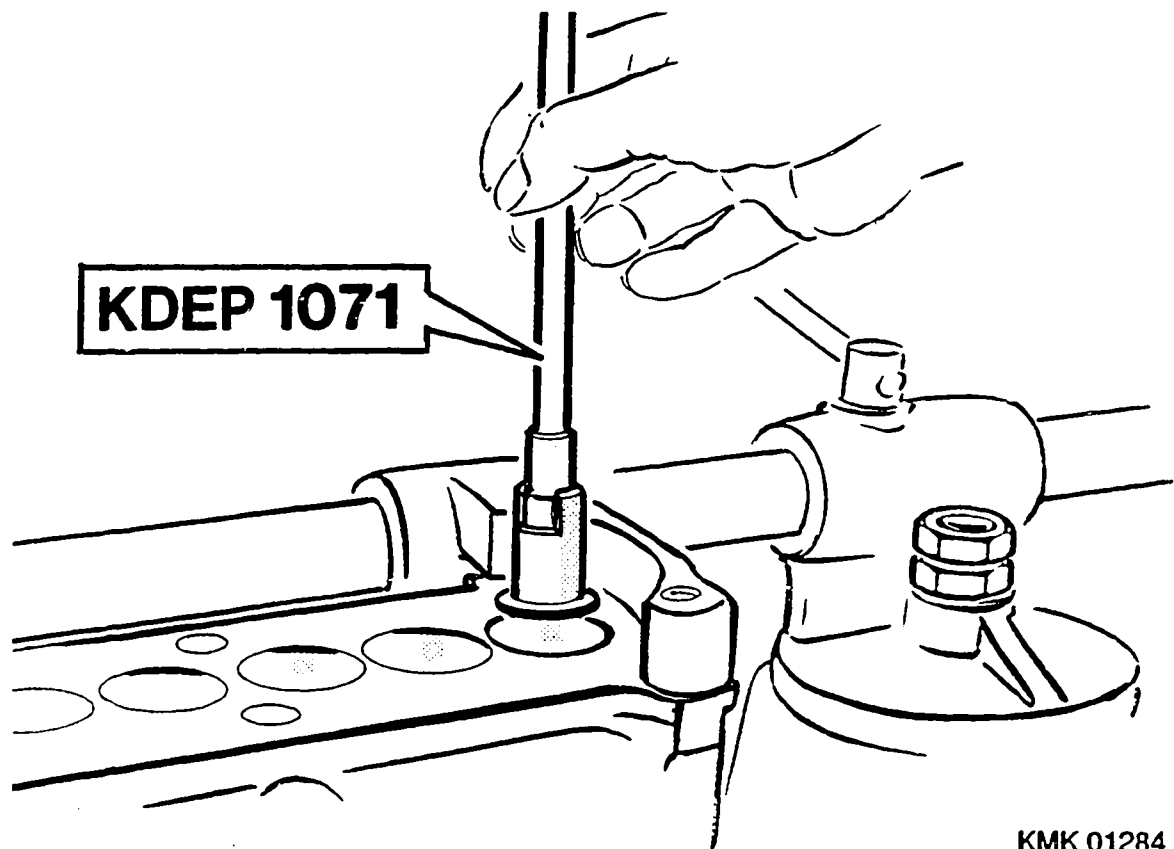
KMK 01283

## INSERTING CONTROL SLEEVES

Insert control sleeve with assembly tool KDEP 1071 such that drive-hub balls of control sleeves engage drive-hub slots in control rod.

In doing so, constantly check control rod for freedom of movement.

Continue: E04/1 Fig.: E03/2

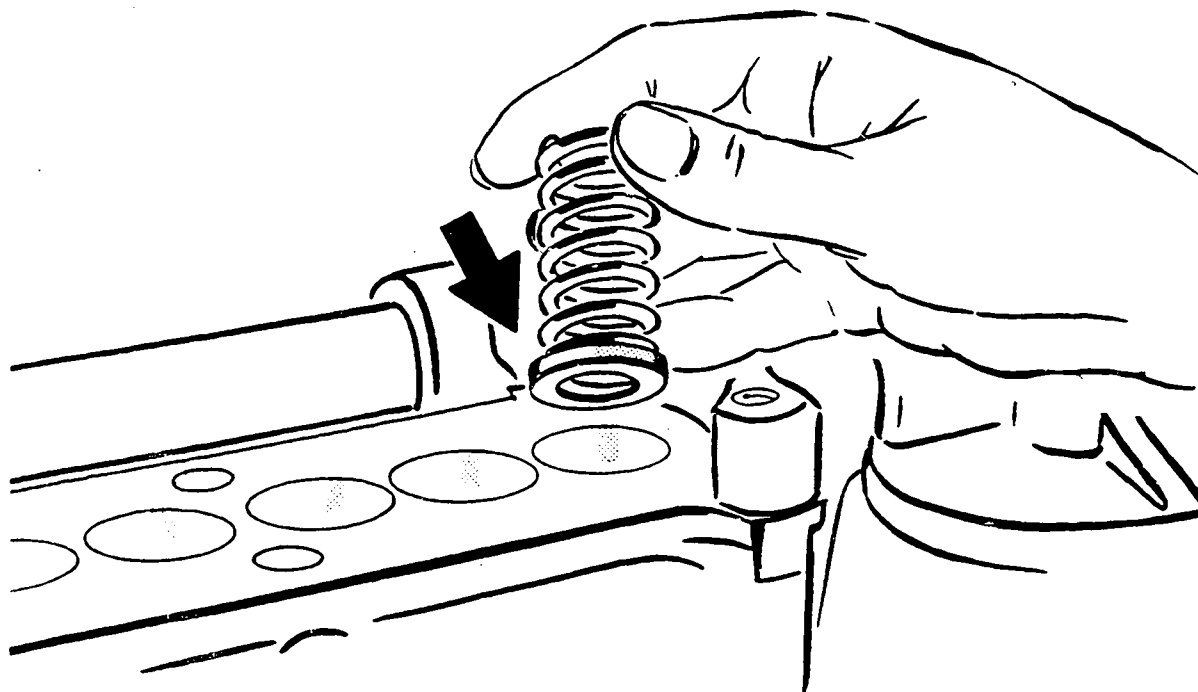


KMK 01284

## INSERTING COMPRESSION SPRING

Stick compression spring into upper  
spring seat with grease and insert  
into pump housing.

Continue: E05/1 Fig.: E04/2



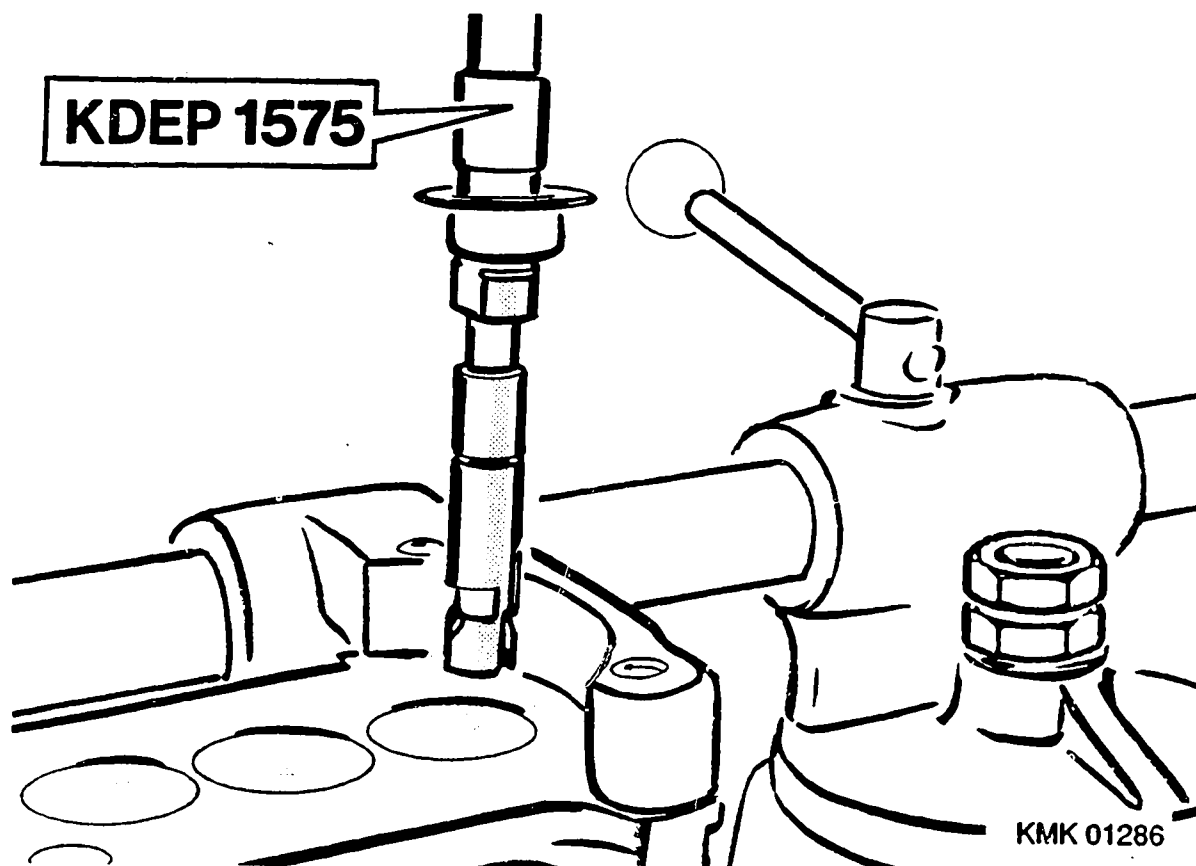
KMK 01285

## INSERTING PUMP PLUNGER

Place lower spring seat on bottom of pump plunger.

Insert pump plunger and spring seat into pump barrel with pliers KDEP 1575 in such a manner that mark on plunger control arm points towards back of pump (control rod).

Continue: E06/1 Fig.: E05/2



## FITTING ROLLER TAPPET

### Safety measure:

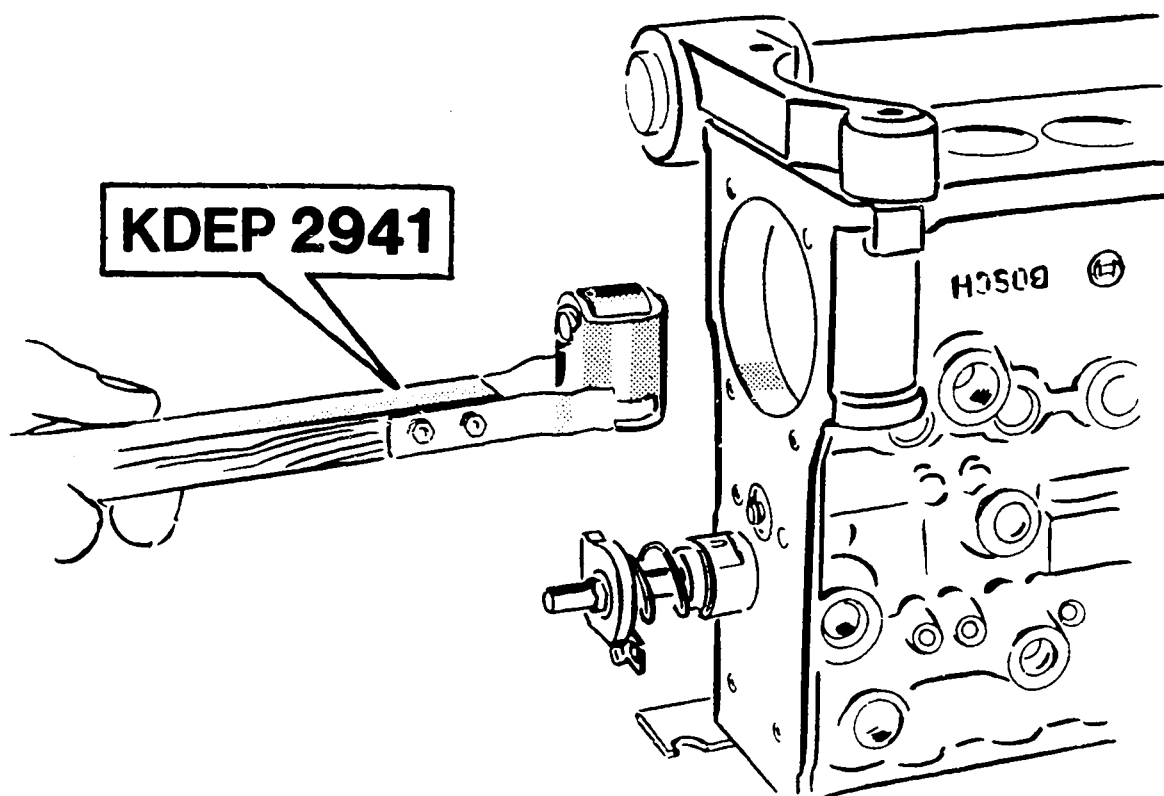
The procedure outlined in the Section "FITTING ROLLER TAPPET" must be performed with extreme care. When carrying out this operation, there is a possibility of sudden tappet-spring release and thus a DANGER OF INJURY !

Continue: E07/1

## FITTING ROLLER TAPPET

Clamp roller tappet in tappet forceps KDEP 2941 and insert into camshaft chamber through opening in bearing end plate in such a manner that the position of the tappet guide coincides with the guide groove of the roller-tappet hole in the pump housing.

Continue: E08/1 Fig.: E07/2



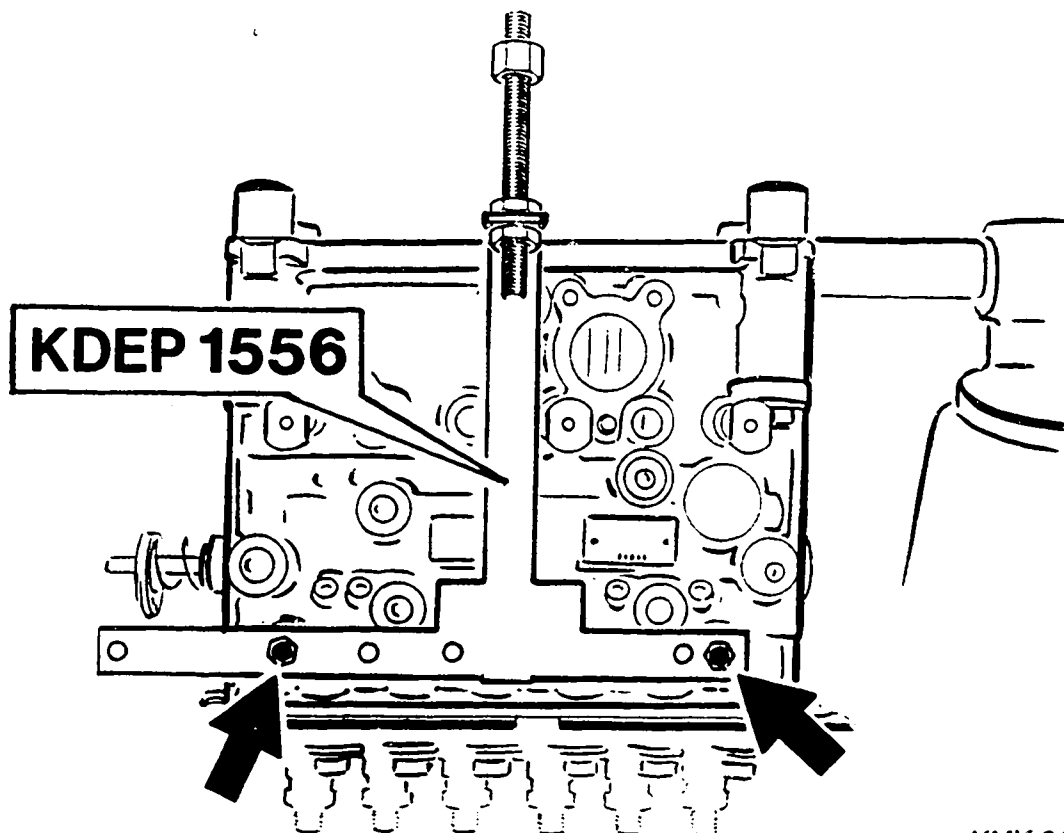
KMK 01240

## FITTING ROLLER TAPPET

Attach assembly device KDEP 1556 to pump housing.

To do so, the fastening screws (arrows) are to be inserted into the tapped holes in the fuel inlet/return line and tightened.

Continue: E09/1 Fig.: E08/2



KMK 01238

## FITTING ROLLER TAPPET

Attach tubular lever of assembly device KDEP 1505 to retaining pin of assembly device KDEP 1556.

Attach thrust pin to roller of first roller tappet. Carefully press roller tappet into tappet hole in housing in such a manner that the tappet holder KDEP 1553 can be inserted as far as the housing stop.

Continue: E10/1

## FITTING ROLLER TAPPET

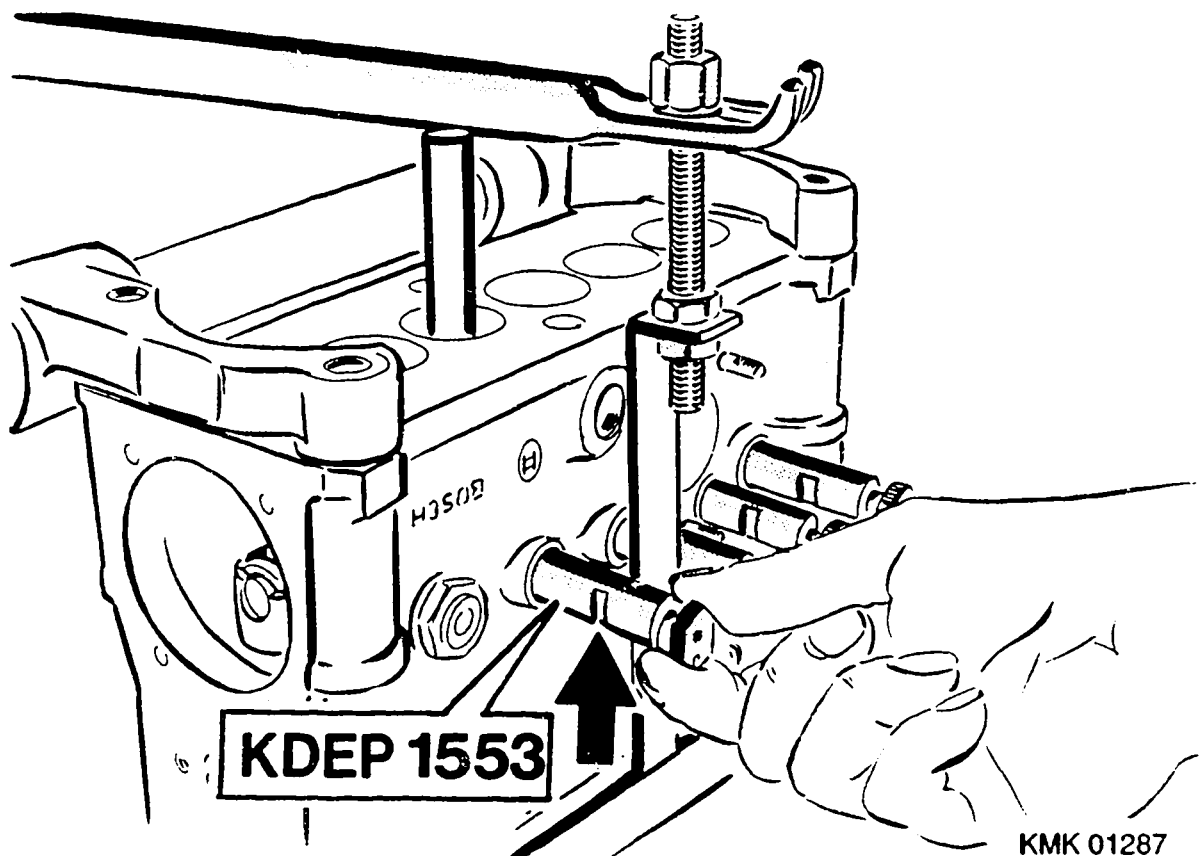
The milled keyways (arrow) on the side of the tappet holder must always be perpendicular.

### Note:

If the roller tappet cannot be inserted far enough, the control rod is to be moved with the tubular lever released until the roller tappet can be completely pressed into its guide hole.

Remove assembly device KDEP 1556.

Continue: E11/1 Fig.: E10/2

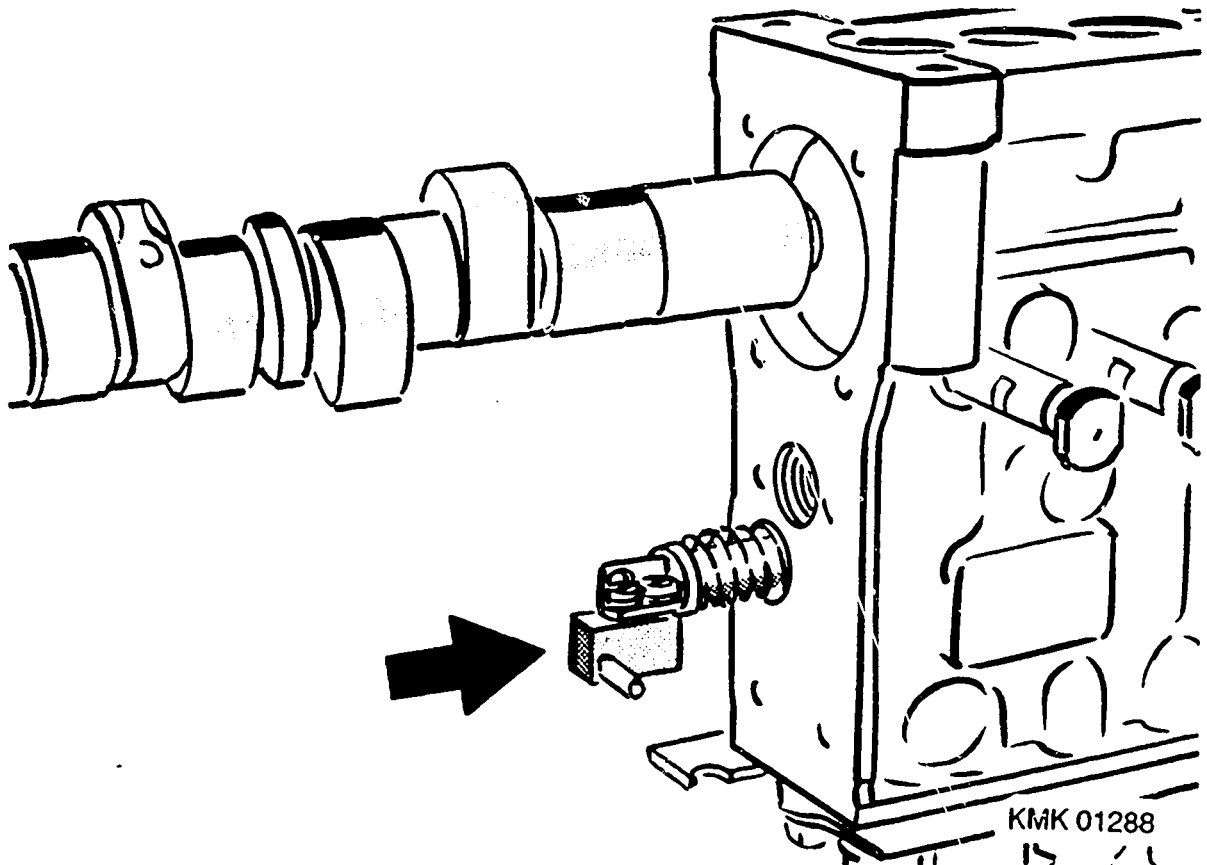


## INSTALLING CAMSHAFT

Insert camshaft with intermediate bearing into pump housing on governor end.

Fit play-compensating spring of control rod and connecting link (arrow)(only with mechanical governor).

Continue: E12/1 Fig.: E11/1



## INSTALLING CAMSHAFT

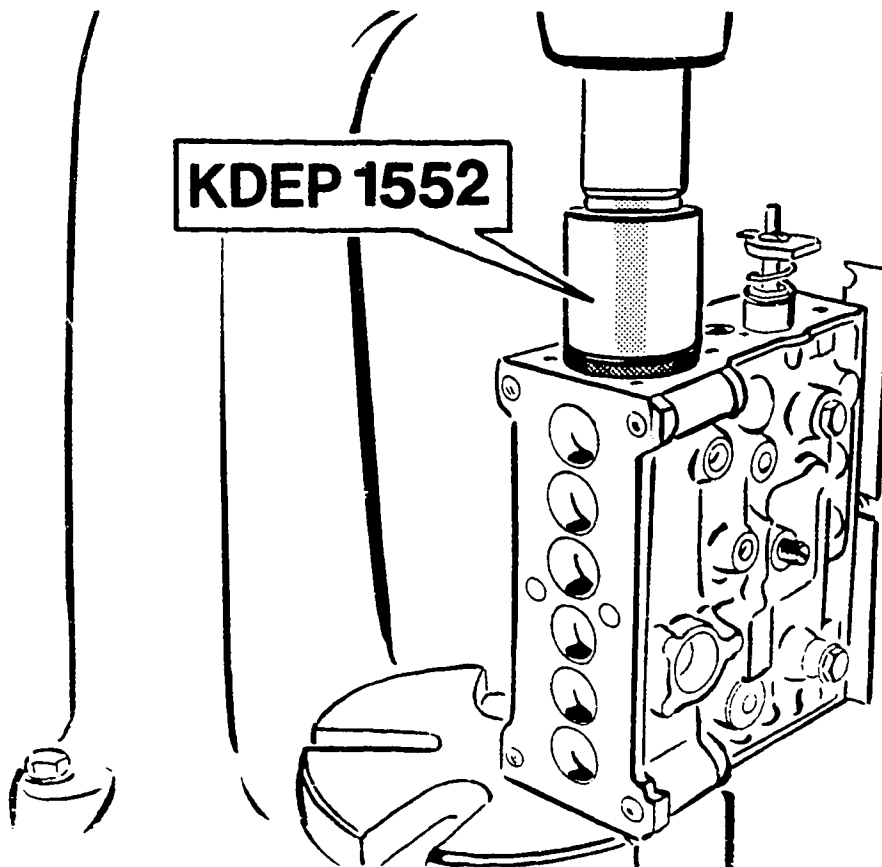
Screw guide nut of KDEP 1552 onto camshaft.

Slip basic body of KDEP 1552 over guide nut and use press to press outer race of governor-end roller bearing into pump housing.

It is advisable to use the support ring KDEP 1568 to support the pump in the case of pumps with end flange and fitted base plate.

Unscrew guide nut of KDEP 1552.

Continue: E13/1 Fig.: E12/2



KMK 01289

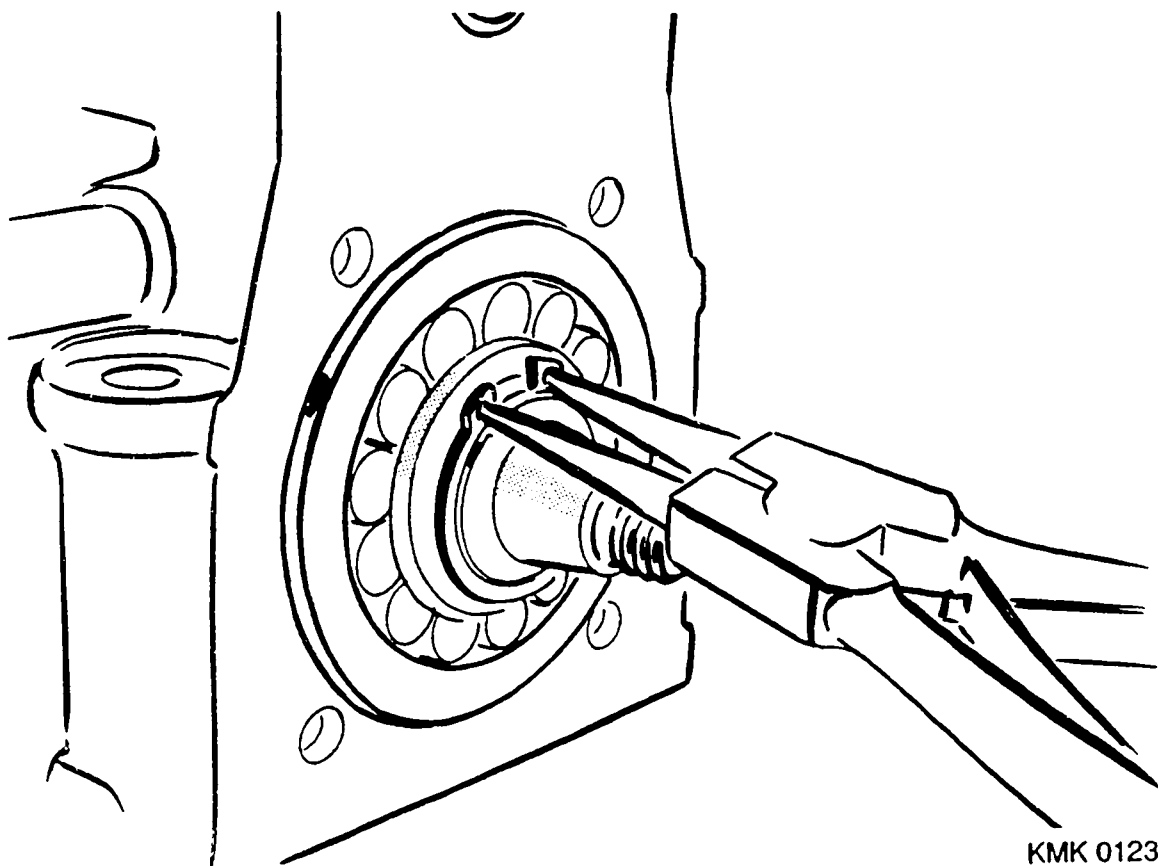
## INSTALLING CAMSHAFT

Fit shaft retaining ring onto camshaft.

### Note:

Applies only to governor-end cylindrical-roller bearing.

Continue: E14/1 Fig.: E13/2



KMK 01231

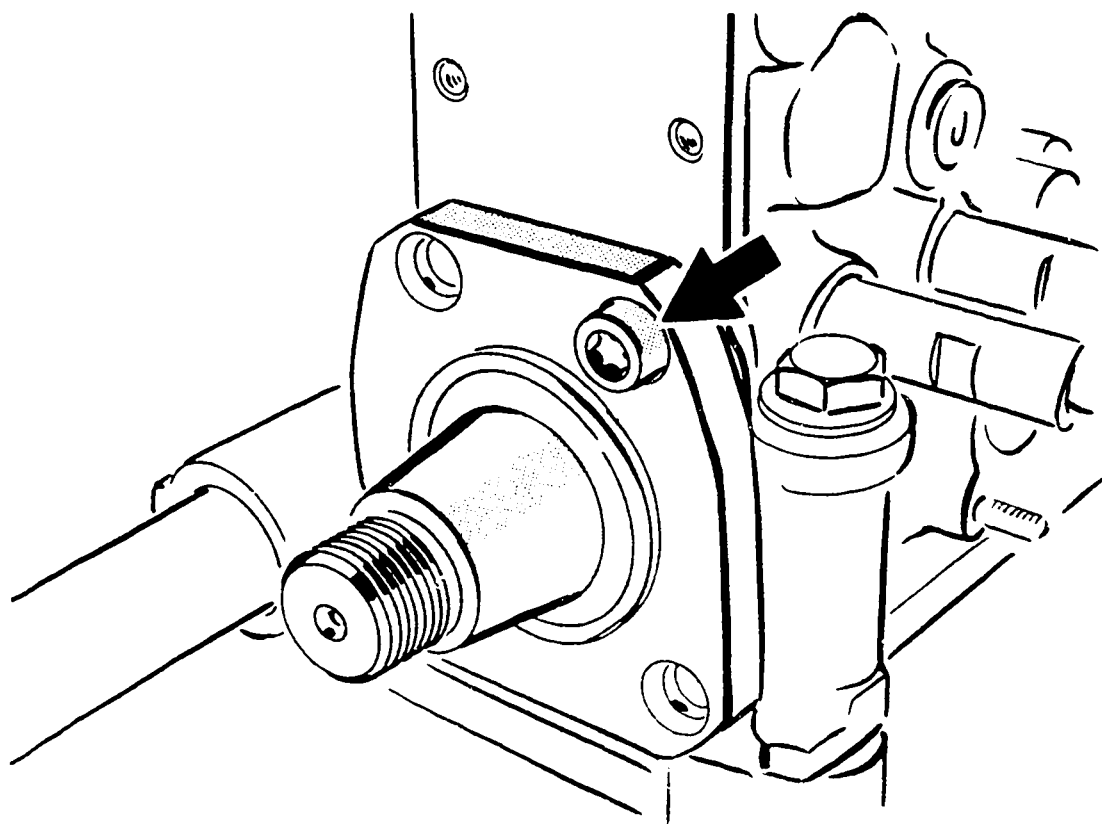
## FITTING BEARING END PLATE

Press drive-end bearing end plate by hand via camshaft into bearing-end-plate hole in pump housing.

In doing so, pay attention to positional overlap of mounting holes with corresponding tapped holes in pump housing.

On assembly, use must be made of the new, micro-encapsulated screws. Screw in all fastening screws of bearing end plate (arrow) and tighten to prescribed tightening torque 18 ... 20 Nm.

Continue: E15/1 Fig.: E14/2



KMK 01232

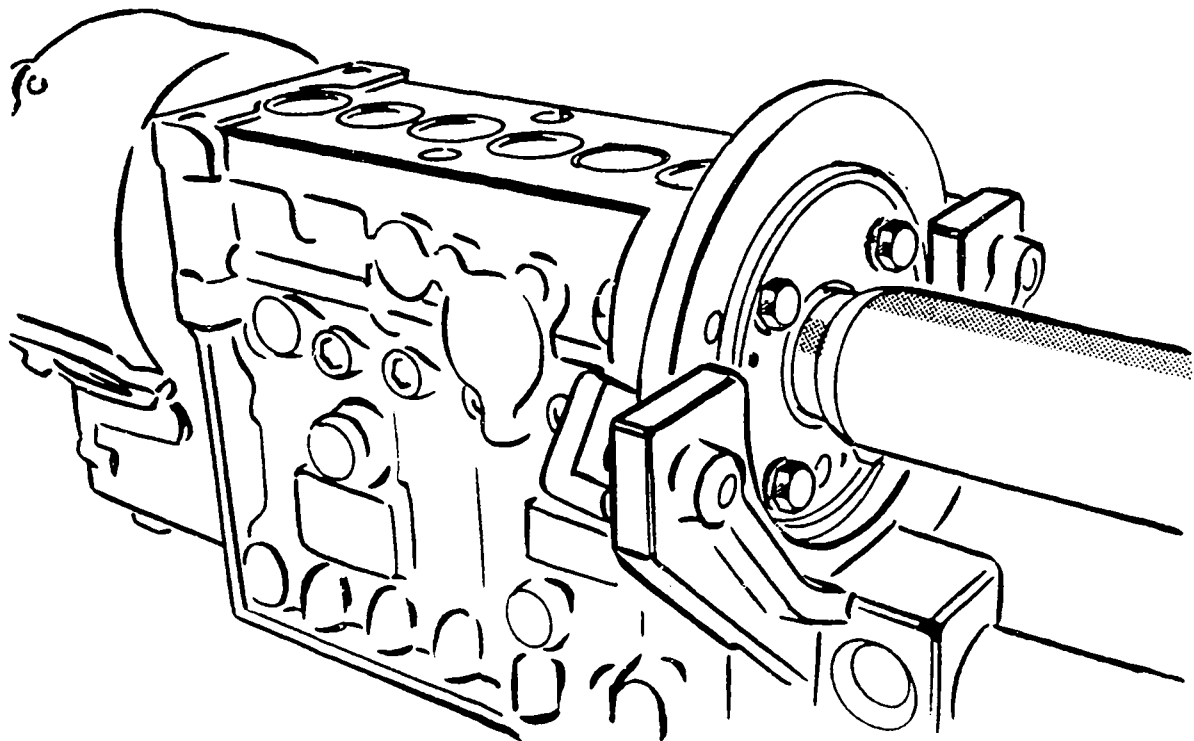
## INSTALLING CAMSHAFT

Without applying grease, slip drive-end radial-lip-type oil seal over assembly sleeve KDEP 1548 or KDEP 1549 and camshaft.

Depending on diameter of camshaft taper, use pressing-on tool KDEP 1558 or KDEP 1559 to press radial-lip-type oil seal into envisaged recess in bearing end plate.

To facilitate installation, apply tallow to outer ring of radial-lip-type oil seal.

Continue: E16/1 Fig.: E15/2



KMK 01291

## INSTALLING CAMSHAFT

Screw new fastening screws (1) with resilient sleeves (2) into intermediate bearing (picture a).

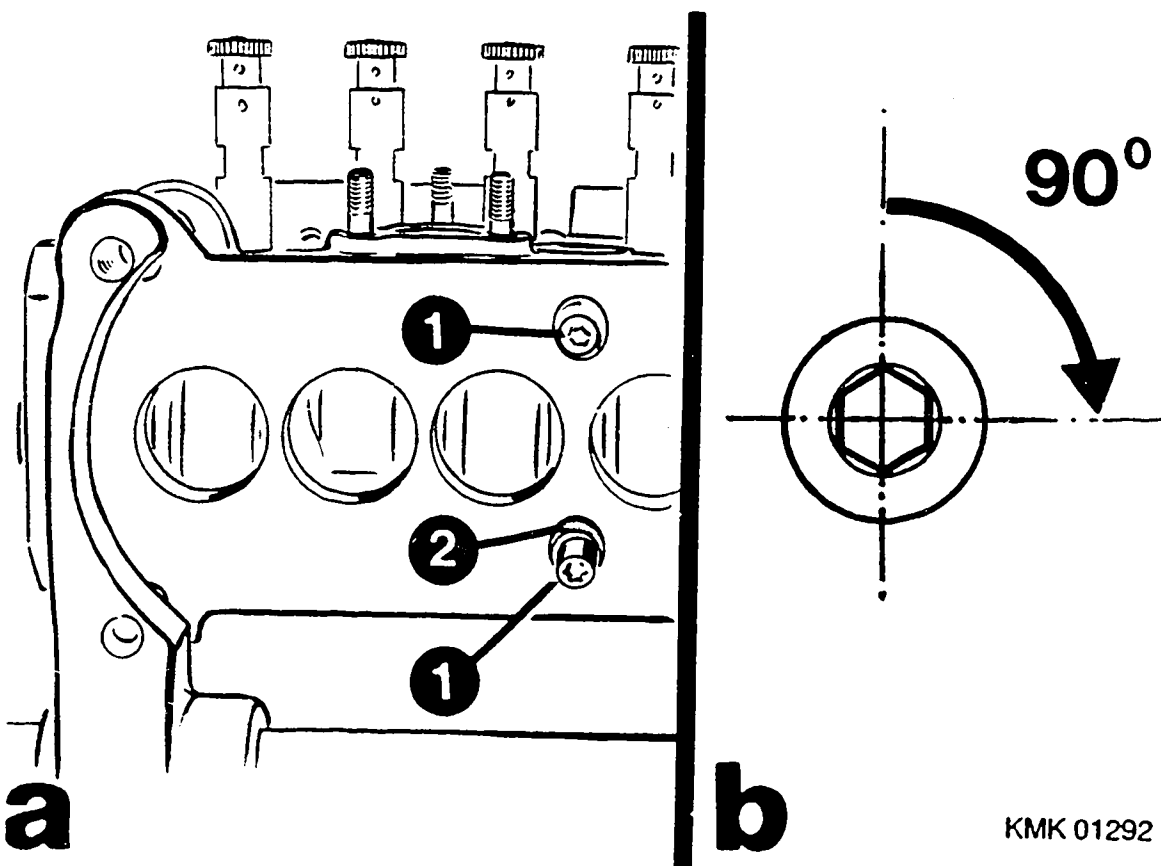
Tighten screws to pre-tightening torque of 7 ... 9 Nm.

Then turn screws by a further 90 degrees and secure (picture b).

### Note:

The tightening specification in line with the angle tightening method must be adhered to, in order to guarantee screw tightness and freedom from leaks.

Continue: E17/1 Fig.: E16/2



KMK 01292

## INSTALLING CAMSHAFT

Residual micro-encapsulation must be removed from tapped holes in pump housing using M6 tap. Then clean holes.

Insert seal into governor housing.

Screw governor housing onto pump housing.

### Note:

On assembly, use must be made of new, micro-encapsulated screws.

Continue: E18/1

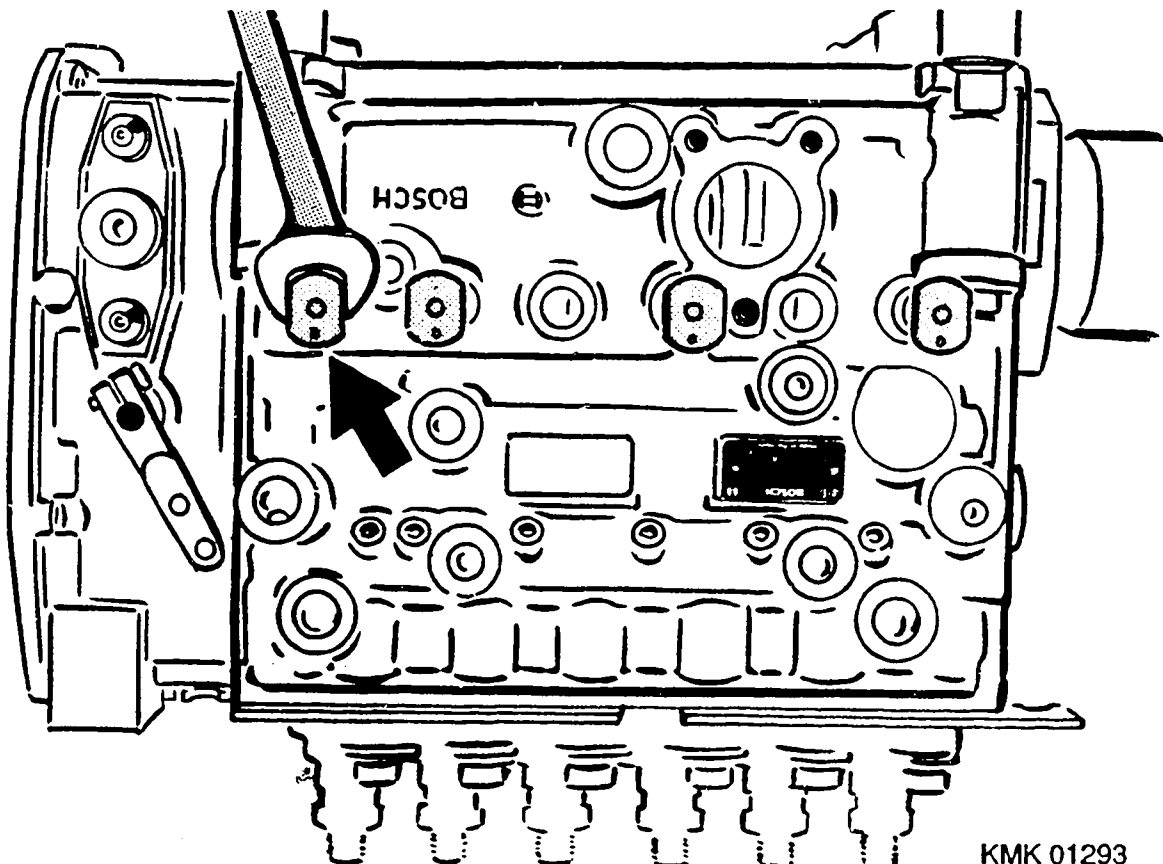
## INSTALLING CAMSHAFT

Attach drive coupling to drive-end taper of camshaft.

Turn camshaft with holding wrench KDEP 1555 and gradually turn eccentric bolts of the tappet holder KDEP 1553 by 180°, thus lowering the roller tappets onto cams of camshaft.

Remove tappet holder (picture).

Continue: E19/1 Fig.: E18/2

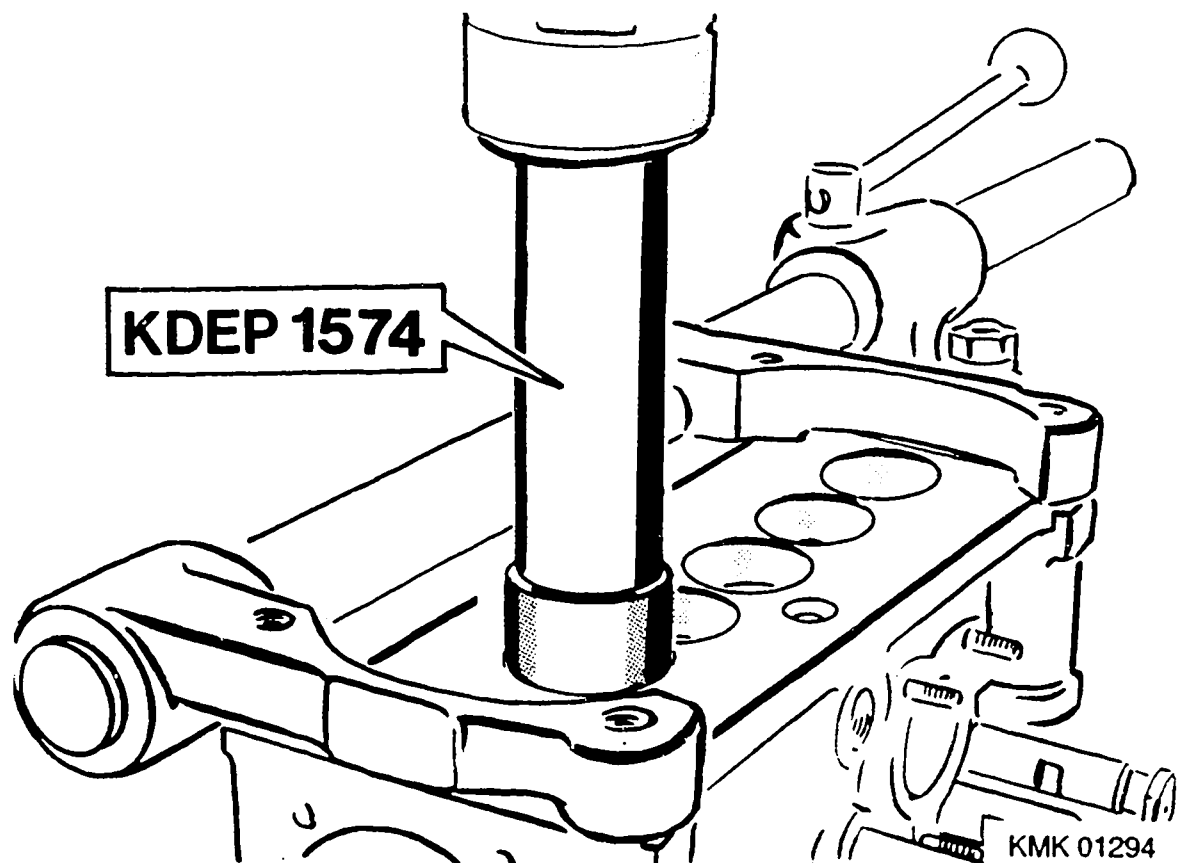


KMK 01293

## INSTALLING CAMSHAFT

Knock end covers into assembly holes on bottom of housing with pressing-in mandrel KDEP 1574.

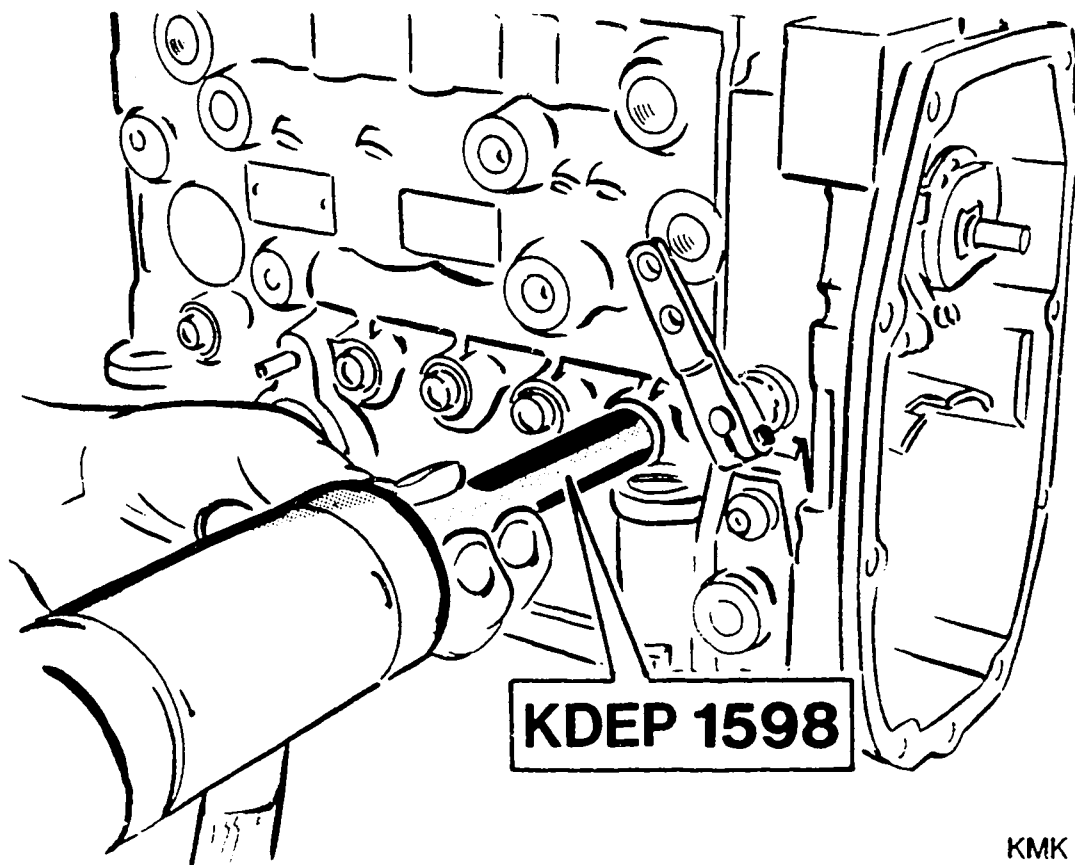
Continue: E20/1 Fig.: E19/2



## INSTALLING CAMSHAFT

Seal mounting holes for tappet holder  
with new metal covers using pressing-in  
mandrel KDEP 1598.

Continue: E21/1 Fig.: E20/2



KMK 01295

## INSTALLING PRESTROKE SHIMS

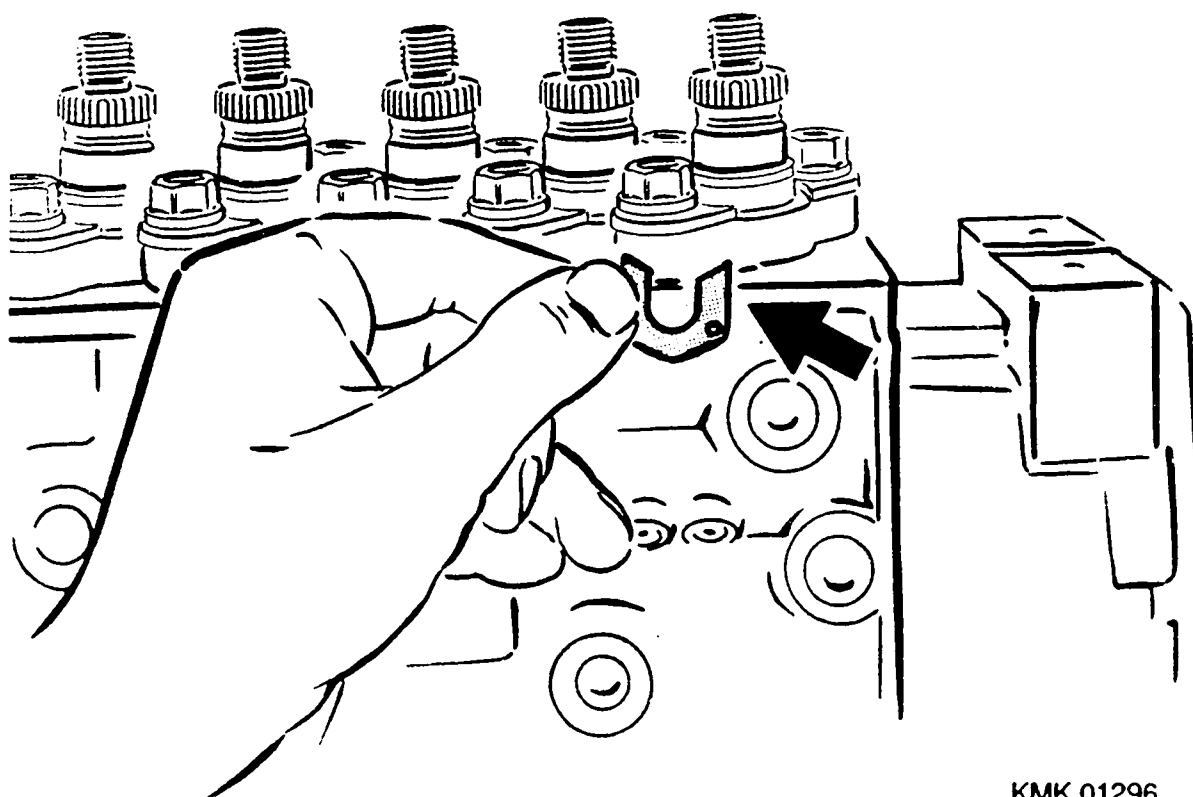
Loosen fastening nuts of barrel-and-flange elements.

Remove spacers KDEP 1550.

Insert prestroke shims beneath flanges in the same manner as they were installed prior to pump disassembly (arrow).

Tighten fastening nuts to 40 ... 45 Nm.  
Check freedom of movement of control rod.

Continue: E22/1 Fig.: E21/2



KMK 01296

GOVERNOR ATTACHMENT

Fit governor in accordance with  
respective repair instructions.

Continue: E23/1

## LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

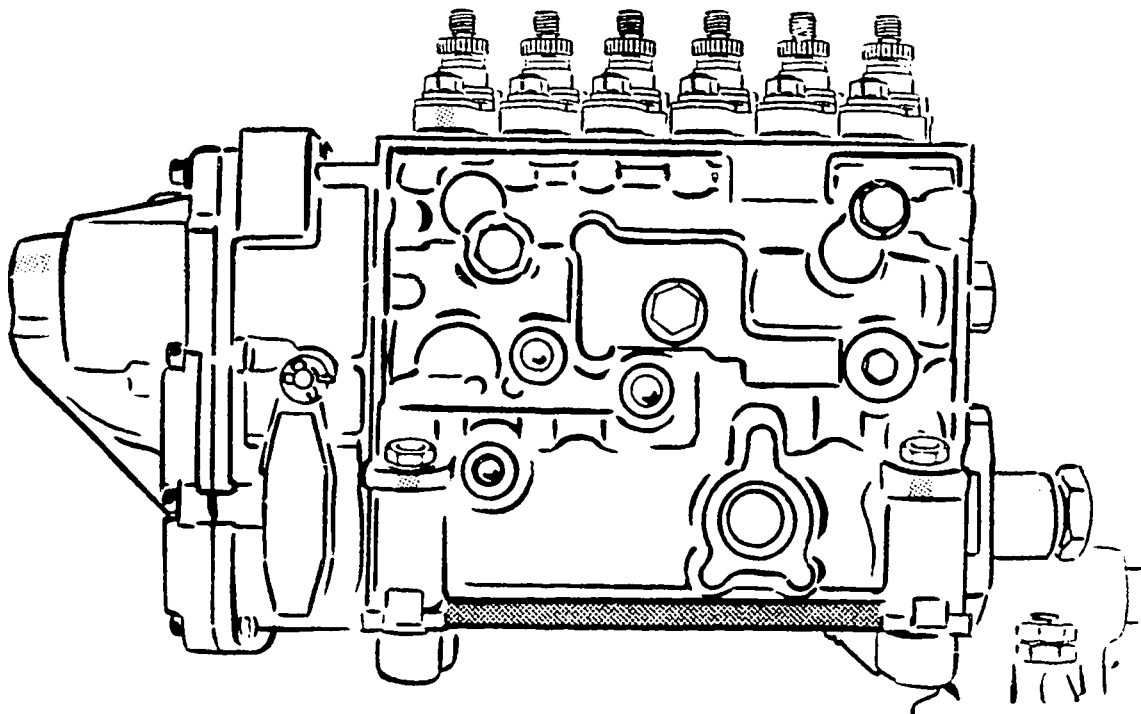
Completely assemble pump (picture).

Supply the compressed air required for the leak test to the camshaft chamber at a suitable location (e.g. oil check hole).

Immerse pump perpendicularly into test bath.

The delivery-valve holders must not be flooded with calibrating oil.

Continue: E24/1 Fig.: E23/2



KMK 01215

## LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

### Note:

To avoid the possibility of skin irritation, apply protective cream to hands before starting test and wash hands in soap and water upon completion of testing. Wear rubber gloves if possible.

Continue: E24/2

## LEAK TEST ON CAMSHAFT, SPRING AND GOVERNOR INTERIOR

- \* 7 minutes at 1.5 bar, then  
1 minute at 0.5 bar.

Perform visual inspection to establish whether all sealing surfaces, unions, sealing rings and end covers on housing and cover are leakproof.

There must be no visible air bubbles.

Set fuel-injection pump on pump test bench.

Continue: A01/1

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## EDITORIAL NOTE

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Automotive-Equipment After-Sales  
Service  
Technical Publications Department  
KH/VDT,  
Postfach 10 60 50, D-7000 Stuttgart 10

Published by:  
After-Sales Service Department for  
Training and  
Technology (KH/VSK).  
Time of going to press 09.1991.  
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